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Cybersemiotics: Suggestion for a Transdisciplinary Framework Encompassing Natural, Life, and Social Sciences as Well as Phenomenology and Humanities

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Theoretical Study

Abstract

The modern evolutionary paradigm combined with phenomenology forces us to view human consciousness as a product of evolution as well as accepting humans as observers from "within the universe". The knowledge produced by science has first-person embodied consciousness combined with second-person meaningful communication in language as a prerequisite for third-person fallibilist scientific knowledge. Therefore, the study of consciousness forces us theoretically to encompass the natural and social sciences as well as the humanities in one framework of unrestricted or absolute naturalism. This means to view conscious quale life world with its intentionality as well as the intersubjectivity of culture as a part of nature, and therefore the whole human being as treated in modern bio-medicine. The 'bio' is not enough. The crucial question for a transdisciplinary theory of conscious human being is therefore: What is the role of consciousness, signs, and meaning in evolution as well as in cultural development? But this is problematic since the sciences in their present form are without concepts of qualia and meaning, and the European phenomenological-hermeneutic "sciences of meaning" does not have an evolutionary foundation. It is therefore interesting that C.S. Peirce phaneroscopic semiotics - in its modern form of a biosemiotics - was based on a phenomenological basis as well as an evolutionary thinking and ecology of sign webs at the same time drawing on knowledge from the sciences. To develop this 100 year old paradigm it is necessary to supplement it with the knowledge gained from the technologically founded information sciences, as well as systems, and cybernetics in order to produce a transdisciplinary alternative to logical positivism on the one hand and postmodern constructivism on the other. Cybersemiotics constructs such a non-reductionist naturalistic framework in order to integrate third-person knowledge from the exact sciences with first-person experiential knowledge produced in the humanities as well as second-person knowledge of the communicative interactions on which the social sciences are based.

Keywords: Cybersemiotics, Transdisciplinarity, Biosemiotics, Peircean semiotics, Consciousness, phenomenology

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Introduction on the Scientific Problem of Awareness and Experience

When looking into none-living nature, in computers and robots, the structure and dynamics of language, or in living nature to investigate the brain neuro-physiologically no one has managed to find any qualia, experience, emotions or awareness, only matter, electrochemical impulses and transmitter molecules, hormones and functional structures of neurons, glia, and muscles cells and other functional structures. My philosophy of science point is that "the brain" is a physiological concept or model of a material complex thing, which we believe is intricately connected with the production of our perception and subjective feelings. However, "the brain" is an objective thing; it is not a subjective experience. The brain is not me as a subject and the brain probably does not "have experiences". If it has, then I do not know them, because I only know mine. I have them; the brain does not. Therefore, "the brain" cannot have subjective thoughts and it cannot in itself be subjective; only I can. If you are modelling subjective processes I do not think you are modelling the brain.

New brain scanning techniques make it possible to see which parts of the brain are used in what kinds of perceptions, actions, and moods by following the increased flood of blood to the active parts, as the brain uses a large amount of oxygen. We can also induce certain feeling, mood, and sensation qualities or the memory of them, which people report orally, when we stimulate the brain electrically or do and say certain things to people. We can, through electrical stimulation of nerves, make limbs move and organs function. We can also externally register and describe the interaction between sense stimuli and behaviour in meticulous experiments with humans and other living beings as it has been since the hay days of Skinner's radical behaviourism and the European ethology of Lorenz and Tinbergen. However, no matter how refined our empirical scientific approaches become, we cannot find any experiences in the brain. It does not matter if it is our own or other animals. The felt awareness seems to be found on another level of abstraction (Hinde, 1970). Something central about the brain's function, as an organ, escapes us (McGinn, 2000, pp. 66-68; Hofstadter, 2007, p. 373; Searle, 2007). The scientific tragedy is that our only access to the first person experiences itself is indirectly through interpreting verbal or written testimonial as well as interpretation of behaviour from the experiencing person. We seem to have no direct scientifically verifiable access to the quality of experience and meaning of other people. Thus far, our most direct access to the first-person experiences is through meaningful verbal or written communication from the experiencing person (Heil, 2004, p. 3). But the body seems to have its own non-verbal experiences. How do we measure how much of it we are able to be conscious about and what part of that we are able to give verbal report of? This is our main problem in philosophy as well as in medicine, especially in psychosomatics. We have no idea how the idea of standing up from the chair we sit in to fetch a cup of coffee is able to translate into the physiological processes that create the movements of the body.

It is a very fundamental point and one of the reasons that I believe there are limits to what science can come to know about conscious experience and why phenomenology has a point. The subjective experiences are not a part of the scientific universe, because it only deals with objective phenomena. We can say that the existence of subjects is somewhat of an inductive objective theory, though we cannot measure subjectivity in itself. It does not have a mass, energy contend or a momentum, or any kind of movement we can measure. It is outside objective measurement. I find this point crucial in understanding the limits of the scientific way of producing knowledge.

Among other things, it means that language and culture are "in the way". We cannot

experience other people's experiences directly. What people experience, when doing certain behaviours, we only know from their own reports, though we can see what part of the brain they use or how they behave externally as well as internally, physiologically. The paradox of modern attempts to work towards a "science of consciousness" is that we have no direct scientific empirical access to the experiential qualities of will, intentions, and meaning on which to build such a science (Edelman, 2000). As a philosopher of science, it seems to me that this is why we have the qualitative phenomenological, hermeneutical, and discourse theoretical methods of humanities and the social science. However, they are not really considered to be scientific by the natural sciences; only the brain sciences are (Bennet & Hacker, 2007).

Nonetheless, as responsible and experientially aware social citizens, we are not identical to our brains (Edelman, 2000, p. 1) although we do need them in order to stay conscious. However, we seem to be a more complex integrative product of physical, chemical, biological, social, mental, semiotic, and communicative systems producing/produced by culture and language. The brain and the body surely are important components of this product, but so is the ability of living systems to produce experience, and think about and communicate them in language. This is the problem, which some formulate as an explanatory gap (Thompson, 2003; Levine, 1983).

There is no agreement on how to formulate this explanatory gap problem (Rorty, 1980). Therefore, I will suggest a working hypothesis here: The attempt to explain consciousness through a scientific physicochemical, and informational and computational paradigms results in the claims of phenomenological paradigms that our knowledge or process of knowing is based on an experiential world (what Husserl called a 'life world') prior to any culturally developed scientific explanations. His method was to attempt to put these influences in parenthesis or bracketing (Epochè) to try to get to the pure phenomena or the "thing in itself" through a systematic peeling away of their symbolic layers of meanings until only the thing itself as "originally" meant and experienced remains (Husserl & Bundgård, 1997; Husserl, 1999).

Husserl's (1970, 1999) problem was that our consciousness and intentionality always are infected with intersubjective linguistic and cultural mentality conceptions, and ontological assumptions of the situation at hand. Consequentially, in order to get to the pure phenomenon he must seek beyond those. We, thus, conclude that even phenomenology has trouble to get to experience in itself. This basic phenomenological position is shared by Edmund Husserl, Maurice Merleau-Ponty, and Charles Sanders Peirce and his development of a triadic phaneroscophy is the point of departure for his semiotics. I find these three authors most relevant for the problem I here want to discuss. I have selected them as the most interesting defenders of the European phenomenological transdisciplinary view (I am well aware that there is a multitude of others). When analysing the phenomenologically based work of C. S. Peirce, which he calls phaneroscopic, it is clear that his three categories are foundational to his whole semiotic and pragmaticist paradigm, and are developed over many years. Joseph J. Esposito's *Evolutionary Metaphysics: The development of Peirce's Theory of Categories* (1980) describes this quest in a most profound way. From this new form of phenomenology Peirce attempted to prove mathematically that triadic relations cannot be broken down to duals. Though, this triadic view has never been widely accepted.

I do find the phenomenological argumentation very convincing and recently supported by many other developments in science. Nonetheless, the fundamentality of the triadic thinking has been the stumbling block for many scholars failing to accept Peirce's

paradigm. But one should not under-estimate how deep reflections of logic - including the logic of relations, time, reality, continuity, the moment, perception, and meaning - are connected to this path-breaking invention of Piece. Here is one of Peirce's paradigmatic foundational formulations:

Phaneroscopy is the description of the *phaneron*; and by the *phaneron* I mean the collective total of all that is in any way or in any sense present to the mind, quite regardless of whether it corresponds to any real thing or not. If you ask present *when*, and to *whose* mind, I reply that I leave these questions unanswered, never having entertained a doubt that those features of the phaneron that I have found in my mind are present at all times and to all minds. So far as I have developed this science of phaneroscopy, it is occupied with the formal elements of the phaneron.

(Peirce, CP 1.289 (by convention CP refers to Peirce (1931-35 + 1958) Collected Papers of Charles Sanders Peirce, Volumes I-VI and VII +VIII collected in a CDROM or books, citations give volume and paragraph number, separated by a period.))

The formal phaneroscopic elements inspired from pure (abstract) mathematics can then be derived from this combination of a phenomenological and a mathematical analysis:

It seems, then, that the true categories of consciousness are: first, feeling, the consciousness which can be included with an instant of time, passive consciousness of quality, without recognition or analysis; second, consciousness of an interruption into the field of consciousness, sense of resistance, of an external fact, of another something; third, synthetic consciousness, binding time together, sense of learning, thought.

(Peirce, CP 1.377)

Our gap-problem is that these, the natural scientific and the phenomenological paradigms, are in Kuhn's (1996) term incommensurable. They do not have the same epistemological and ontological conceptions. They have two different maps of reality, and either one's map is not on the others. The life sciences and the social sciences again cover different areas of reality. The structures of language or market economy are as real as the structures of a rock, but they are different aspects of reality.

Thus, this is my philosophy of science working hypothesis of what is the root of the explanatory gap. My suggestion of a cure is to contribute to the crafting of a transdisciplinary framework – inspired by Popper, Luhmann, and Peirce - wide and deep enough to contain both paradigms and thus enlarge our ontological conception of reality. I have called the framework Cybersemiotics, as it attempts to combine the two major attempts to make unified theories for cognition and communication and intersubjective, systematic, and consistent systems of knowledge: 1. The informational-cybernetic, and 2. The semiotics-phenomenological-hermeneutical meta-paradigms.

If we - for instance, for the sake of medicine - want to create a transdisciplinary scientific theory of information, cognition, consciousness, and meaningful communication (see Cowley et al., 2010 for starting such an attempt), then it seems the first problem that we need to attend to is to adjust the ontology in the theoretical framework, whose purpose is to make the integration of the different subject areas possible. Furthermore, the various subject areas and paradigms self-description and concepts of knowledge and truth have to be made compatible in a bigger context. In lack of a better word a "transdisciplinary paradigm" is what I will call what it is that we aim for. The concept transdisciplinary science is supposed to cover the sciences, and humanities and social sciences, much like the German word 'Wissenschaft' or the Danish word 'videnskab'. Basarab Nicolescu (2002) wrote a profound work on the meaning and consequences of transdisciplinarity, which is called *Manifesto of Transdisciplinary*.

Is consciousness a part of reality?

A basic problem in our culture's systematic knowledge production is that the natural and social sciences, and the humanities do not agree on a common definition of reality. We talk about the physical, mental, and social reality, but do not really know how to bring them together into a larger conception. Instead, they are each of them individually often attempting to take over the power of defining reality.

It has been a problem ever since Otto Neurath (1983) introduced the logical positivistic idea of a unity of science based on physicalism. The physical world is here considered to be the given. The critique from the social sciences and the humanities has never stopped since. Its most alternative reaction has been to produce radical forms of social constructivism disclaiming any kind of positivistic truth claims. Most radical social constructivists consider political ideological as well as cultural conceptions of reality to be the primary reality, of which science and the phenomenological life world is only one product out of many. Phenomenology from Husserlian and Peircean traditions insist on a third view; namely that the experiential phenomenal world is the given reality and the truth is to be found in analyzing its structure, be it as intentionality schemata (Husserlian tradition) or basic categories of cognition in the form of sign types, which is the then developed into a semiotics (Peircean tradition). The eternal foundation that Husserl (1970, 1999) was seeking in the pure intentional structures or forms of conscious awareness became for Peirce semiotic dynamical ways of knowing that emerged from Firstness as 'may-bes' and developed into 'would-bes' in Thirdness through the evolution of reasonableness:

Once you have embraced the principle of continuity no kind of explanation of things will satisfy you except that they grew. The infallibilist naturally thinks that everything always was substantially as it is now. Laws at any rate being absolute could not grow. They either always were, or they sprang instantaneously into being by a sudden fiat like the drill of a company of soldiers. This makes the laws of nature absolutely blind and inexplicable. Their why and wherefore can't be asked. This absolutely blocks the road of inquiry. The fallibilist will not do this. He asks: may these forces of nature not be somehow amenable to reason? May they not have naturally grown up? After all, there is no reason to think they are absolute. If all things are continuous, the universe must be undergoing a continuous growth from non-existence to existence. There is no difficulty in conceiving existence as a matter of degree. The reality of things consists in their persistent forcing themselves upon our recognition. If a thing has no such persistence, it is a mere dream. Reality, then, is persistence, is regularity. In the original chaos, where there was no regularity, there was no existence. It was all a confused dream. This we may suppose was in the infinitely distant past. But as things are getting more regular, more persistent, they are getting less dreamy and more real.

(Peirce, CP, 1.175)

To Peirce, Firstness is an unbroken continuity of pure mind or feeling, quality, and tendencies to become existent in what Peirce called Secondness.

The social sciences and humanities have felt dominated by biologistic scientistic reductionist explanations of experience and behaviour of human beings like Dawkins' selfish genes, memetics, and E. O. Wilson's socio-biology and his later attempt to make a unified view from it (Blackmore, 2000; Dawkins, 2006, Wilson, 1999). What this reductionist meta-scientific paradigm is supposed to mean is most clearly spelled out in Edward O. Wilson's *Consilience: The Unity of Knowledge* (1998). Taking up the torch from logical positivism, Wilson predicts that most of the humanities will be replaced by hard scientific knowledge, just like neuroscience will

eventually tell us what conscious experience is. Consilience, literally a "jumping together" of knowledge, has its roots in the ancient Greek concept of logos, which is the vision of an intrinsic orderliness governing the Cosmos. The problematic view much science and analytic philosophy has inherent is, that Logos is comprehensible by formal logical process only. A reason to believe that Peirce's semiotics can move us out of this predicament is that he combines his view of semiotics and logic in an evolutionary pragmatic framework. He writes:

Logic will here be defined as formal semiotic. A definition of a sign will be given which no more refers to human thought than does the definition of a line as the place which a particle occupies, part by part, during a lapse of time. Namely, a sign is something, A, which brings something, B, its interpretant sign determined or created by it, into the same sort of correspondence with something, C, its object, as that in which itself stands to C. It is from this definition, together with a definition of "formal", that I deduce mathematically the principles of logic.

(Peirce, 1980, pp. 20-21 & p. 54)

For Peirce pure mathematics is more fundamental than logics and in combination with phenomenology is the foundation of his metaphysics, as we have already shown. According to Peirce, logic is developed from mathematics and not the other way around, as some researchers and philosophers believe. This view clashes with the received view of science, which does not include phenomenology. As a function of the logos and unity of science view, the received version of science denies the validity of all claims and practices other than its own. In this way it turns science into a kind of war machine, destroying all other discourses and points of view, which the physicist and philosopher Paul Feyerabend (1975) was already aware of. The same critique applies to the information and computer science-based cognitivistic explanations of human social coordination and communication (Brier, 2008a). However, natural science was confronted by the social sciences in what is called the "linguistic turn" in philosophy of science and various forms of constructivism, from solipsistic radical ones to social constructivisms; all undermining the objective authority of science's explanations of how the world works (Brier, 2009a). This ignited what has so often been called the 'science wars', of which not much good emerged aside from a realization among some researchers of the necessity to construct a new integrating transdisciplinary framework, in which all can work together in a fruitful way.

Nicolescu (2002) is one of the rare examples of a quantum physicist doing a non-reductionist transdisciplinary philosophy of Wissenschaft. One fact that has been emerging from the science wars with the social science and humanities is the realization that the natural sciences were dependent on the language they were formulated in, and that language, worldview, and mentality were deeply interconnected. Thus, we are back to Neurath's basic ideas, since we have given up on the idea of a special objective scientific language combining logic and mathematics to unite all Wissenschaft. Thus, theories of language, cognition, and the conditions for signification had to be integrated into the interpretation of scientific data. This is another reason for introducing Peirce's semiotics (Peirce, 1958). Semiotic is a research project mainly conducted from 1865-1910 by Charles Peirce, to provide an understanding of the logic of scientific method, which he informed, by a semiotic, phenomenological, and pragmaticist view of knowledge, aimed at providing insight into the methodological commonalities found in all attempts to produce scientific knowledge, or one could say the semiotic processes of science. The project ended as a semiotic paradigm with a new transdisciplinary ontology and epistemology. As Emmeche writes:

A logical implication of the ontological-

phenomenological basis of Peirce's semiotics … points to an interesting continuity between matter, life and mind, or, to phrase it more precise, between sign vehicles as material possibilities for life, sign action as actual information processing, and the experiential nature of any interpretant of a sign, i.e., the effects of the sign upon a wider mind-like system.

(Emmeche, 2013, p. 118)

The issue of what are awareness of sensory information and its qualia, how we come to interpret sense experience, and how it is connected to subjectivity is also a problem at the basis of philosophy of science, as well as questions of truth and meaning, and how science is placed between them or may contribute to integrate them. Thus, the difficult problem of why we have qualitative phenomenal experiences is not a superficial question; rather, it is one that demands that we dig deep down to the prerequisite for our way of producing knowledge, worldviews, and explanations (Bennet & Hacker, 2007).

Thus, in this article I will suggest a way to address these problems through a philosophy of science reflection on the limitation of coherence and consistency in our generally accepted but specialized epistemological and ontological frameworks in the natural, life, information, and social sciences, and humanities.

The first move towards constructing a transdisciplinary framework (or meta-paradigm) including the natural sciences, phenomenology, and a paradigm of semiotic-linguistic constructionism is to accept that natural, life, and social scientific knowledge, and knowledge in the humanities is created in intersubjective meaningful communicative action by embodied living systems and that we are unable to give any final proof of its truth. This is in accordance with Popper's (1972) and Peirce's (1958) idea of fallible objective knowledge. This view is also based on the fact that meaningful intersubjective communication is still - like first person consciousness - not yet scientifically explainable. Furthermore, we need to be aware that the life sciences have their own perspective, which we also need to integrate, since all the conscious beings we know today are embodied in living, autopoietic systems. No computers, artificial intelligence (AI), or robots can produce conscious awareness presently. AI is still not artificial consciousness (AC).

The intersubjective and the autopoietic embodied subjective awareness of differences that makes a difference combined through semiotically based communication are prerequisites for all intersubjective productions of knowledge. All scientific knowledge demands embodied minds meaningfully sharing interpretation of sense experiences through signs. Robots do not make science. Bits and signals between machines (still) do not produce communication that has vital meaning for living embodied systems of awareness.

Meaning is, thus, in a way created before and outside the realm of natural science, as we know it today, in ordinary social language, since subjective and intersubjective cultural meaning is explicitly removed from the foundational framework of the classical positivistic influenced concept of science in order for its strive towards knowledge of universal character mostly in the form of deterministic or statistical laws. In order to obtain objectivity in the empirical sciences it is usually taken for granted that one must remove any influence of the subjective and cultural ideas of reality. This fact presents one aspect of the problem of a scientific explanation of consciousness, as subjective awareness and meaningful communication is not really deeply reflected into the concept of scientific objective knowledge. Heelan (1987, 1988) has spent a lifetime investigating and arguing for the relevance of hermeneutics and phenomenology for the understanding of scientific observation and interpretation of data, which is also the main point of Gardamer's (1989) main work.

Integrating the Four Views on Consciousness in the Cybersemiotic Star

Cybersemiotics suggests then, that we have four different approaches to the understanding of cognition, communication, meaning, and consciousness. First, are the exact natural sciences, second, the life sciences, third, are the phenomenological-hermeneutic interpretational qualitative "sciences", and forth, is the sociological discursive-linguistic cultural view. We are here inspired by Wittgenstein's (1958) pragmatic linguistic view, but not only that. The Cybersemiotic paradigm views the production of knowledge from the middle, where we, as embodied aware semiotic and communicating living systems, create knowledge in a cultural and an ecological surrounding. This means that we cannot attribute more importance to one of the four systems of knowledge than any of the others without committing a reductionism or an unfounded one-sided simplification of reality. Thus, the four approaches are all equally important. This philosophy is parallel to Bruno Latour's break with modernity in his book *We Have Never Been Modern* (Latour, 1993), but inspired by Merleau-Ponty (1962). I work with four main paradigms, where Latour works primarily with the dichotomy between nature and culture.

In Latour's Actor Network Theory and philosophy of science (Latour, 1993, 2004), explaining consciousness only through the brain as a natural entity is nearly an impossible idea. Because, what are considered "natural entities" by science, are "hybrids" for Latour and they achieve their existence for us through a semiotic network of actants. Nevertheless, Latour does not deny that they have a "Ding an sich" existence. We should not forget that Bruno Latour's (1993, 2004) theory of hybrids and actor network theory is based on a semiotics inspired by Greimas's actantial model that is a semiotic combination of material existence and social role as created by a narrative. Latour views science as one narrative of the working of nature among many possible narratives based on the data we have so far. However, not all stories about nature have been shown to be viable. Latour's view is thus of a semiotic processual kind. Its semiotics is not really a Peircean version (Brier, 2008d), but a special brand of Saussurian semiology developed by Greimas and further formed by its inclusion in Latour's realistic vision of a communicative/semiotic network of humans and things (including technology and cultural artefacts) viewed as 'hybrids'. It is a realistic vision of living and dead natural entities we relate to and which act back on society and changes it (the HIV- virus is an example) (Latour, 2007, pp. 10-11). Despite the fact that many call Latour a social constructivist and a postmodernist he insists on being a realist. Moreover, the normative view of ANT (Actor Network Theory) is that it should contribute to a better social order, not to breaking things down (Latour, 2007). This places him closer to Peircean semiotics than Saussurian semiology.

Science is a cultural product. It is a technology which we use in order to see, understand, and manipulate the nature on which our existence is dependent. The tool of scientific discourse based on empirical investigations makes us able to describe the part of reality we need to understand and in that process ascribe meaning to it and its processes. That certainly does not mean we are able to describe all of nature or give consistent meaning to all we have described so far, such as the relation between brain, culture, and consciousness.

The idea of figure 1, called the cybersemiotic star, and the epistemological turn it is illustrating, is to escape the great explanatory burden of reductionist mainstream science, wanting to explain both life and consciousness from its basic assumption of energy and mathematical mechanistic laws. The cybersemiotic philosophy of natural life and social sciences, and humanities sees their different types of explanations moving from our present state of socio-linguistically common-sense based conscious semiosis towards

self-organized and highly specialized autopoietic systems. Each of them develops towards a better understanding of the prerequisites of language, culture, and our self-conscious subject, and their production of systematic knowledge in a time perspective.

There are four forms of historical explanations going on: 1. The cosmological (physic-chemical), 2. The biological (biosemiotics and biosciences), 3. The historical (socio-cultural), and 4. the subjective perception of a life time: the experienced time.

The cybersemiotic star, illustrates the equal importance of the four basic approaches, and from the model a few other points can be made. To be a realist about the possibility of science giving us usable knowledge about reality is to accept the reality of language, autopoietic embodied minds, culture and non-cultural environments, and the idea that our knowledge springs from processes of interaction between them. However, that is something quite different from believing in reductionist explanations from one of the arms of the star. I agree with Steffensen and Cowley (2010, p. 348) that we must move toward a much more non-local understanding of mind. What they call "… a transdisciplinary non-local approach to bodily, cognitive and interactional processes."

The natural sciences work towards making one grand cosmogonist explanation; but lack theories of individual experiential awareness, the semiotic aspects of life, and the workings of social-linguistic reality. Interestingly, George F.E. Ellis (2004), in his framework, also accepts that there are four different worlds, though his

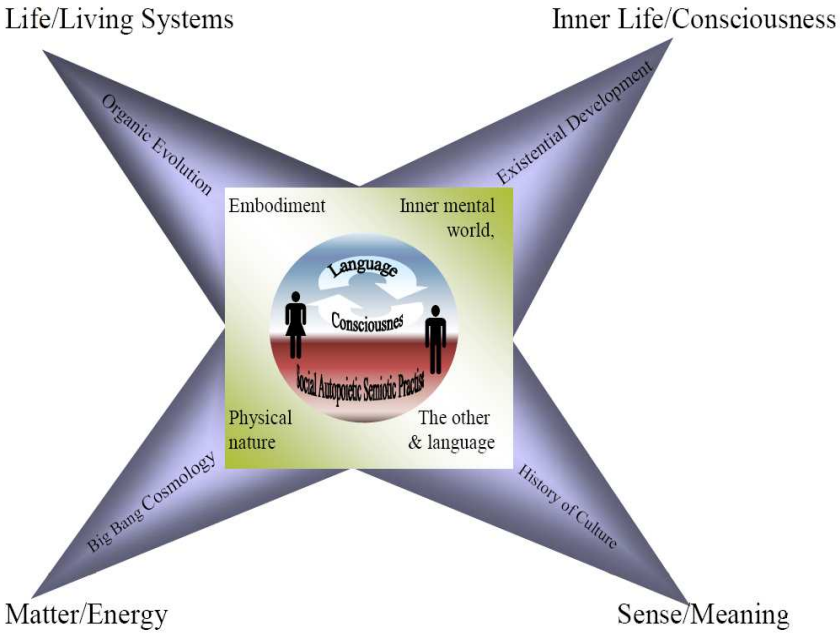


Figure 1. The cybersemiotic star: A diagram of how the communicative social system of embodied minds' four main areas of knowledge arises. Physical nature is usually explained as originating in energy and matter, sometimes also information, and living systems as emerging from the development of life processes (such as the first cell). Social culture is explained as founded on the development of meaning and power in language and practical habits. Finally, our life world is explained as deriving from the development of our individual life world and consciousness, in a spiritual and religious framework often ultimately from an objective transcendental spirit or as a soul coming from a personal creator or God.

forth is mathematical abstract reality and not linguistic intersubjectivity, as it is stipulated in Cybersemiotics. However, so far we have not resolved the problem of the emergence life and consciousness in evolution. Until we do, we might have to accept that an all-encompassing explanation of the meaningful conscious communication process cannot be provided from any one of the corners of the model alone. I argue further for this in the rest of the article. As we cannot reduce our scientific explanations to one grand story and claim it to be the one and only reality, my theory is that we have to juggle and combine all four types of knowing at the same time. This puts us in a new situation and changes the research questions about consciousness, as we will argue further in the rest of the article.

Science works on the assumption that the material world has no sense experience or meaning at all, but only natural laws. The reason for this is that scientists are brought up to think that to indulge in the opposite ontological assumption would make our search for knowledge religious or political, as these are the two major meaning-producing systems we know. Science fought its way out of the powerful grip of religion in the Enlightenment, and later out of totalitarian political ideologies, like Nazism and Communism.

If we stay clear of religion and political worldviews, what are we then to call the meaning interpreting disciplines in the social sciences and humanities? This problem is well known and answers have been developed within phenomenology, phaneroscopy (Peircean triadic semiotic phenomenology), and hermeneutics, of which the ultimate philosophical version was developed by Gardamer (1989). Gardamer's book is clearly developing a philosophy for the humanities and the qualitative social sciences. Are we going to accept meaningful interpretation as part of our view of consciousness and legitimate objective knowledge? I cannot see how we can ignore this fundamental human process of cognition, since human meaningful communication is a prerequisite for the possibility of science. If we want to give scientific answers about the nature of consciousness we must integrate some version of hermeneutics into a transdisciplinary theory of knowing.

In this case we need to move from talking about a science of consciousness to call what we deal with a Wissenschaft of consciousness, as this German concept includes natural, and social sciences, and humanities in a single concept. Thus, my perspective on the explanatory gap will conclusively be: What would be the consequences of looking at the results of behavioural and brain sciences for our understanding of mind and consciousness from an integrated Wissenschaftliges perspective? Can we view qualia and meaning as coming from the culturally embodied languaging mind and understand it in a grander scientific, evolutionary, and ecological view? This is where I think only a Peircean biosemiotics can answer "yes". A realistic and pragmatic conceptualization of sign processes, in all their variations, could be seen as the unitary phenomenon which connects all living natural systems with human cultures and distinguishes them both from inanimate nature. It could serve as the framework that provides the human, social, engineering, business, life, and natural sciences with a common theoretical basis for empirical research. Peirce's realism is, among other things, based on his belief in Secondness, or the unexplainable or random facts. There are immediate differences and resistances between phenomena or different things (Haecceities). Peirce adopts Duns Scotus's term haecceity to designate the arbitrary here-and-now-ness of existence, a person or object's "this-ness", that is, the brutal facts based on relations. This haecceity Peirce identified as 'pure Secondness'. Peirce writes about this fundamental concept in his phaneroscopic semiotics:

Most systems of philosophy maintain certain facts or principles as ultimate. In truth, any fact is in one sense ultimate - that is to say, in its isolated aggressive stubbornness and individual reality. What Scotus calls the haecceities of things, the hereness and nowness of their existence, is indeed ultimate. Why this phenomenon, which is here as we pick it up - like for instance one grain of sand out of billions on a beach - is such as it is and is where it is in space and time we can ask; but the explanation in this case will merely carry us back to the fact that it was once in some other place, where similar things might naturally be expected to be. It is simply an ultimate fact. There is also another class of facts of which it is not reasonable to expect an explanation, namely, facts of indeterminacy or variety. Why one definite kind of event is frequent and another rare, is a question to be asked, but a reason for the general fact that of events some kinds are common and some rare, it would be unfair to demand. If all births took place on a given day of the week, or if there were always more on Sundays than on Mondays, that would be a fact to be accounted for, but that they happen in about equal proportions on all the days requires no particular explanation. If we were to find that all the grains of sand on a certain beach separated themselves into two or more sharply discrete classes, as spherical and cubical ones, there would be something to be explained, but that they are of various sizes and shapes, of no definable character, can only be referred to the general manifoldness of nature. Indeterminacy, then, or pure Firstness, and individual existence as haecceity, or pure Secondness, are facts not calling for and not capable of explanation. Indeterminacy affords us nothing to ask a question about; haecceity is the ultima ratio, the brutal fact that will not be questioned.

(Peirce, CP 3.405)

Peirce's view of haecceities as being unexplainable as singular events is close to the modern understanding of quantum events. Quantum physics cannot deduce the singular event; it can only make a probability model from thousands of them. There is an undetermined spontaneity - what Peirce calls Firstness - of the single event that is not explainable in itself from a scientific point of view. Quantum mechanics, thereby, breaks with classical deterministic mechanicism.

How does the mind collect all these haecceities to one quale experience? One way of formulating this question is in the form of the binding problem, widely discussed in brain and consciousness studies (Chalmers, 1996). It asks how the unity of conscious perception is created in the neurological processes that make up the central nervous system. Thus, an unsolved aspect of the phenomenon of conscious awareness is the mechanisms and laws that produce the unity of conscious perception. Physiologically, we can ask how we create a unified percept from the input from many separate neuronal systems. Beyond this is the problem how, if the image of you that I have already formed presumably is in my brain, is it that I see you out there in the world as a part of a whole? We seem to project our perceptions into an Umwelt for all living systems, and a life world or significations sphere for humans in which we then live.

Some researchers see this as only a neuro-physiological question. In fact it is a question that demands types of answers that extend beyond the realm of physical science alone, since it concerns meaningful subjective and inter-subjective experiences that point beyond physical explanations. Searly defends the view "that consciousness consists of unified, qualitative subjectivity caused by brain processes and realized in the brain" (Searly, 2007, p. 102). In that case, how do we integrate all those different perceptual inputs from inside and outside the body into a life world or a conscious horizon, with ourselves in the centre? The question from science should be: How can we systematically work with any reality beyond

the physical? It is a foundational philosophical problem before any empirical science.

I will here argue that giving answers beyond physics and physicalism does not need to lead to the introduction of elements or worlds outside nature in the way in which Cartesian dualism, for instance, can be interpreted to do in its postulation of a Res Cogitans. The ontological idea is to not place consciousness and the world of thought outside nature in a special mental world. It is rather to expand our ontological views of living nature to a biosemiotic based interdependency thinking of lived sense making (Cowley, Major, Steffensen, & Dinis, 2010). Husserl's work as well as Gadamer's hermeneutical philosophy (Gardamer, 1989) are attempts to give another more comprehensive model for reality, including the sciences and a theory of understanding, communication, and history of culture. Gadamer's theory of interpretation and understanding goes through pre-understanding and the process of the hermeneutical circle in order to integrate parts, plus the subjects' and objects' horizons. The object can be another subject's mind, an artefact, a piece of art or a text. His view is that truth does not spring automatically from using one type of method and naming it "scientific", "mathematical-logical", "empirical", or a combination of them. One has to reflect on the horizon from which one produces knowledge. This is done in order to create understanding in the form of fusing knowledge and experiential horizons (Heelan, 1987, 1988) for all living beings with conscious awareness. Thus, consciousness in the form of awareness and the ability to have sense experiences needs to be conceptualized within an understanding of a natural reality bigger than physics, unless one wants to deny that animals have sense experience and deny that our own animal body is a prerequisite for self-consciousness. We will, therefore, assume that consciousness, matter, and information coexist in, or make up, nature and culture.

To go one step further we might add the work of David Chalmers. Chalmers (1995, pp. 201-202, 1996) is well-known for defining what he calls "the easy and the hard problems of consciousness". The easy problem has to do with the inner workings of consciousness, such as the ability to discriminate, categorize, and react to environmental stimuli, to be able to report mental states by accessing internal states, to focus attention, deliberately control behaviour, and distinguish between mental states. The hard problem, which is the one we are speaking about here, has to do with solving the problem of what the nature of sense experiences and their different qualia - such as pleasure and pain, sweet and sour, colours, and mental images in themselves - might be. That is the problem we are dealing with here in a naturalistic, and therefore, also evolutionary frame. Thus, our question has now developed into: How can the ability to experience arise from what in science is presumed to be a material world?

This very question is asked by Collin McGinn (2000) in his famous book on consciousness: *The Mysterious Flame: Conscious Minds in a Material World*. McGinn is sceptic towards our ability to explain the phenomenon of consciousness, at least with the present vocabulary in our possession. How it is possible in a natural world, which we so far have defined as "material" to "feel like someone" in the way it is framed in Nagel's famous article, *What does it feel like to be a bat*? , or what it mean to experience the sight qualities of, say red or blue (Nagel, 1974). The problem of explaining and modelling in a scientific way the ability to experience qualitative differences in sense experiences is formulated as the question of qualia (Jackson, 1982). How do nervous systems produce sense experiences? However, opposing the importance of qualia are functionalists. They argue that in understanding the function of a system it is not its materiality or its experiential quality that matters. There is no reason to give causal powers to experience. An

example of this denial is Bennett and Hacker (2007) in their Wittgensteinian inspired pragmatic linguistic theory of mind. However, here I will side with Searle (2007) and argue that this functionalistic view does not make the ontological dimension of this problem go away.

This often leads to the assumption that computers have minds (Harman, 1990). Nevertheless, it is important to notice that this is then not an experiential mind in the way I speak about it here.

Another view toward the problem of the limitations of computers for our theories of experiential consciousness is that of Roger Penrose's work. In *The Emperor's New Mind* (1989) and *Shadows of the Mind* (1994), he shows that even in mathematics human minds are capable of non-computable or non-algorithmic processes that go beyond the present capabilities of computers. Based on this, my position in this article will be that only aspects of mind processes can be simulated by computers or algorithms, since most researchers presently agree that computers - as we presently know them - cannot compute awareness, qualia, and meaning. Based on Peircean biosemiotics I side with Searle (1980) against the view of hard AI that symbol manipulation in itself is the core of intentionality. I fail to see how automatic symbol manipulation in computers has anything to do with the production of intentionality and qualia. Biosemiotics is the transdisciplinary study of the biological as well as human significance of codes and sign processes, such as genetic code sequences and intercellular semiotic processes in the nervous, hormone, and immune systems, animal display behavior, and human language and abstract symbolic thought.

Jackendoff (1987) has very precisely framed the problem in the form of the concept of "the mind-mind problem". I agree with him, when he formulates the gap problem as the relationship between "the computational" and the "phenomenological mind". As the philosopher Nagel also points out:

> If we try to understand experience from an objective viewpoint that is distinct from that of the subject of the experience, then even if we continue to credit its perspectival nature, we will not be able to grasp its most specific qualities unless we can imagine them subjectively. ... Since this is so, no objective conception of the mental world can include it all.
>
> *(Nagel, 1986, p. 259)*

Thus, if we do not believe that the brain is only a computer and that informational computation is what creates consciousness in the human body, then it must be something else. Searle (1980, 1989, 2007) argues that it has something to do with our biology. Consciousness and intentionality must be biological products (Searle, 1980, 1989, 2007; Searle, Dennett, & Chalmers, 1997). The secret of consciousness is also the secret of life, one could say.

The tragedy is that biology so far has only been able to give functional definitions of life. Searle (1980) believes that the brain's production of intentionality is like chlorophyll's production of carbohydrates through photosynthesis. Boden (1990), in a critique, points out rightly that experience is a qualitatively different product than carbohydrates. We can describe and measure carbohydrates scientifically, but that is not the case with the quality of experience. As far as we know today, only living bodies can produce the awareness necessary for having experience. To live is to experience, but the living experiencing flesh is still a mystery to the physic-chemical sciences as well as the life sciences in their present non-semiotic form, as Merleau-Ponty (1962, 1963, 2003) has thoroughly argued from the philosophy of embodied phenomenology. As experience is a prerequisite for science, science may not be able to explain it.

Still we must conclude that consciousness has an inescapable biological component. Consciousness is a feature of the brain. However, as Favareau (2010) points out, if this is the case then what we considered the one central

problem is rather a triplet; "What is the relation between mental experience, biological organization, and the law-like processes of inanimate matter?". This is at least how biosemiotics, which analyses the processes of life from a semiotic viewpoint, in addition to the physico-chemical view, sees it. Scientific biology in the form of physics, chemistry and physiology are unable to describe important aspects of the processes of living systems. The suggestion here is that we supplement our physico-chemical knowledge with a semiotic view.

As a mode of inquiry into the psychological activities of the human brain, semiotics has always sought to investigate and develop models of how the mind extracts meaning from physical forms through interaction, and the way in which they can stand for something else. Biosemiotics, including human and cultural semiotics, can be defined as the study of how meanings are created in living systems between signs and the information they encode in the perceptual and cognitive apparatus (Hoffmeyer, 2010). The realization that the embodied cognitive apparatus in humans has evolved and given rise to biosemiotics as the field investigating how different species transform sense experience into perceptual schemas through species-specific semiosis. As a consequence, it has become ever more apparent that sign study cannot avoid biological considerations. As one of the contributors to biosemiotics, I find that, especially in its stringent Peircean formulation with its triadic phaneroscopic categories, it represents a promising way out of dualism, monistic eliminative materialism, and other types of physicalism, and radical forms of constructivism (Brier, 2008d).

But by "semiosis" I mean, on the contrary, an action, or influence, which is, or involves, a coöperation of three subjects, such as a sign, its object, and its interpretant, this tri-relative influence not being in any way resolvable into actions between pairs. {Sémeiösis} in Greek of the Roman period, as early as Cicero's time, if I remember rightly, meant the action of almost any kind of sign; and my definition confers on anything that so acts the title of a "sign."

(Peirce, CP 5.484)

Favareau's way of formulating the gap-problem is, interestingly, a little broader than asking how brains produce minds, as it broadens the field from human physiology to the evolutionary and ecological semiotics and the (comparative) psychology of all living systems with the ability to experience and communicate aspects of their environment.

Such a paradigm was originally formulated as *Umweltslehre* by Jacob von Uexküll (1957, 1982), and later, inspired by him, as *ethology* by Konrad Lorenz (1971) and Niko Tinbergen (1973) (see Brier 1980, 1999, 2000, 2001). Connected to these questions is also the problem of how living systems perceive sense experiences and communicate in the frame of meaning, and why and how they seem to have intentionality. Furthermore, it is a scientific enigma how causality signs and the grammatically ordered symbols of language can evoke feelings, qualia, and images from the body. How can individual emotional purpose enter the nervous system and create semiotic interpretations? How can free will have causal influence, when physics believes that causality is primarily based in initial conditions and universal laws?

In the world of matter, energy, and information, as the natural scientific paradigms presently see the basic ontology or nature, no meaning as such is supposed to be found. As already mentioned, meaning is not part of the paradigmatic foundation for the exact natural sciences. How can, then, the life sciences, of which biology is the most prominent pure (as opposed to applied) one, avoid working with the reality of emotions, intentionality, and meaning? This is a problem Konrad Lorenz struggled with for over 30 years and could not

solve within the natural scientific paradigm (Brier, 2008a; Lorenz, 1971). Most recently, Ellis (1998), inspired by phenomenology, attempted to integrate it with biology:

It is the organism's emotions that motivate it to act on its environment rather than merely react; the phenomenal aspect of conscious experience requires the organism's emotionally motivated action in relation to the perceived world, particularly in its interest in selecting for attentional focus. If the organism's knowledge of its environment is to involve a "felt" dimension, in the sense that there is "something it feels like" to have a state of consciousness, the conscious processing must first flow from an emotional process within the organism, which pre-exists to any particular input, and puts its qualitative stamp on each selected input.

We are suggesting that the "felt" aspect of experiencing is tied in with the fact that organisms are emotionally motivated to "look for" elements of the environment that are significant with respect to the organism's motivational purposes; that the organism "anticipates" experience in terms of motivational categories which preselect for attention; and that the emotions that guide this anticipation and selection process are a major contributor to the conscious feeling of "what the consciousness of such-and-such an object is like".

(Ellis, 1998, p. 431)

The point is, again, that if biology is to encompass the felt experience of animals, its foundation has to differ from that of physics and chemistry. Present biology is, therefore, not enough. Hoffmeyer (2008) writes that scientific description in gene-fixed reductionist biology, "exclusively deals with phenomena that may be described in the language of third-person phenomena, and thus ... excludes this science from arriving at a theoretical understanding of the human biosystem as a first-person being" (Hoffmeyer, 2008, pp. 333–334).

Thus, we need a Wissenschaft, which includes a theory of signification and meaning; this is exactly what biosemiotics attempts to create. Emmeche (2013) writes:

The semiotic approach means that cells and organisms are not primarily seen as complex assembles of molecules, as far as these molecules – rightly described by chemistry and molecular biology – are sign vehicles for informational and interpretation processes, briefly, sign processes or *semiosis*.

(Emmeche, 2013, p. 118)

However, this view is not a possibility for energetic, molecular, or even informationally founded biology. Kull, Deacon, Emmeche, Hoffmeyer, and Stjernfelt (2009) discuss what this kind of Wissenschaft biosemiotics could and should be, and suggests a qualitative modeling science he calls Sigma-science after Vihalemm (2007).

In the humanities, on the other hand, there are dominant paradigms designed to analyze human qualitative and intentional consciousness, culture, and language. These include phenomenology, hermeneutics, linguistics, rhetoric, discourse, and cultural analyses and semiology. The humanities are concerned with the world of meaning as produced by humans in society through language, art and social interactive practice. However, if you ask contemporary researchers in the humanities what the ontology of meaning is, they usually answer: "It is just a social and cultural construction!" as though that was not real and not also biologically based! The social world held together by communication is the dominant reality we live in.

The reality of social phenomena is surely something other than physical reality, but the social world of meaning and values has a very real influence on our cognition and behaviour, and it can be described systematically, as Max Weber showed in his research and exemplified in *The Protestant Ethic and the Spirit of Capitalism* (Weber, 1930). About the ontological evolution of meaning, social constructivists can only give

answers within the historical time frame of tens to thousands of years. Biological evolution is not part of their paradigmatic framework. From a biological evolutionary viewpoint, meaning has a history of millions of years in the development of living systems. This is a story biosemiotics attempts to tell, since our conclusion here is that ordinary science is not conceptually equipped for it (Emmeche, 2013). Thus, we should encompass the social and the individual experiential reality, and their history in nature. Nonetheless, how are we going to connect them? Where to put the brain in experience?

Chalmers' *The Conscious mind: In Search of a Fundamental Theory* (1996) collects nearly all the material in science and philosophy we had on the subject at that time, except Peirce's semiotic philosophy. His suggestion of a solution is a type of double aspect theory, where the experiential is seen inside the information we can measure in the processes in the brain. However, viewing objectively defined information and experiential meaning as two aspects of "the same" does not solve the deep troublesome problem lying in the obvious observation, that I am not my brain. One should not commit the merological fallacy to contribute to the part that only makes sense when attributed to the whole. It is not the brain that experiences; it is embodied human persons in a culture with a language (Bennet & Hacker, 2007; Cowley et al., 2010).

My brain is part of me. Thus, who or what is phenomenological me? Am I the inner non-material linguistically informed product of my brain? Is it then possible that conscious awareness and experience is something we are missing in our scientific explanations of living systems' perception, cognition, and communication as we know them? Like for instance, black matter and energy was missing in cosmological descriptions of the universe evolution. They were concepts introduced because we were lacking something to harmonize what we observed astronomically with the physical laws we have developed until today. What we saw and measured did not fit with the laws we believed were universal. After introducing the new aspects of physical reality christened "black energy" and "black matter", what we before had considered being the whole of material reality, now showed to be 3-4% of the whole. Thus, a revolutionary new cosmology was created by introducing new ontological elements.

The parallel I am arguing for is that what we now consider the material reality of biological systems could turn out to be just a few percentages of the whole of living system. Because, we missed something vital for the function of living systems; namely signs and sign functions.

On the level of social sciences, we know that we are consciously experiencing a world through processes that are unconscious for us. We do not know what we do when we see, feel, and intend, and act accordingly. However, most cultures and societies hold their citizens responsible for their acts. How can we understand the emergence of our abilities, the basics of which we seem to share with the animals? Materialistically based evolutionary and ecological theory forces the question, that if culture comes out of nature how do experiential subjects emerge from an objective world? Or do they? Is that the right way to ask the question? Is reality not a much more entangled non-local affaire? Here, I am not thinking about research, which accepts the experiential aspect of life in the living, and therefore describes how it has developed through evolution. It is works like Donald (2001) that describes the evolution of consciousness and its forms from a bio-psychological platform, and Sonesson (2009) who bases his work on phenomenology, Piaget and aspects of Peircean semiotics, or the work of Zlatev (2009a, 2009b), that in an evolutionary framework uses aspects of Peircean semiotic terminology, but not his ontological foundation. Nor am I thinking of Deacon (1998), or his later articles (2007, 2008) which stray more and more

away from a Peircean foundation. None of these use the Peircean philosophical framework (Peirce, 1958). I think in order to take McGinn's (2000) question seriously.

Thus – in my view – a pure materialistic and scientific theory cannot answer the question I am asking, because it cannot describe the feeling of being aware, experiencing qualia, will, and intentionality. They can only describe physiological and behavioural consequences. Thus, the philosophy of ontological reflection behind physics and scientific knowledge in general seems to be required; because the unity of conscious experience, in spite of the numerous neuro-physiological systems that underpin it, does not really have a physical scientific meaning. It can have a social meaning, since we talk about it, based on our interpretation of others' behavior in the belief that they have inner mental states with causal powers over their behaviour.

My claim from the cybersemiotic star is that the physical is only one aspect of our world as are the formal and computational. The problem of the living embodiment of intentionality, emotions, and qualia in social interaction is a difficult and important question for any computational view of the mind that aims to go further than a Turing machine foundation, as we have no artificial instantiation of these phenomena.

The Idea of Cybersemiotics

The transdisciplinary frame for information, cognition, and communication science called cybersemiotics (Brier, 2008a, 2010a) is an attempt to show, using Peircean biosemiotics, how to combine knowledge produced in the natural, the life sciences, and the social sciences, and the humanities, as each describe an aspect of consciousness.

But first, we have to consider the incompatibility between the two transdisciplinary paradigms attempting to create a theory of consciousness. With an expression from Kuhn´s (1996) paradigm theory, their theories on thinking and communication suffer from incommensurability. The first paradigms are cybernetic information theory and cognitive science, which are actually technology oriented paradigms. Many members of this worldview have the deep problem that they usually do not consider their views to be founded on metaphysical postulates at all, but only common sense reality. Therefore, they do not want to be drawn into metaphysical speculation or philosophy. Many people have the misconception that modern physics is concerned with the world as we know it in our daily life. Nothing can be further from the truth. Quantum field theory and the special and general relativity theory, super string theory, and black holes, dark matter, and the likes are totally outside of our common sense. If you ask people to interpret everyday physical process, most of them give explanations close to Aristotelian physics. Thus, the majority of human beings have not even moved into a Newtonian paradigm, not to speak of Einstein's, Bohr's, Feynman's, or Hawking's. Modern physics have no direct bearing on awareness, meaning, and common sense. Still to this physicalistic worldview many researchers of World War II inspired by cybernetics attempted to add information and computation to explain the emergence of conscious awareness.

Building an enlarged new worldview by adding the concept of information to energy, space, time, and force, and imagining that all natural processes including consciousness and emotion can be fruitfully described and understood in a grand theory of natural computation (G. Dodig-Crnkovic, 2010; Dodig-Crnkovic & Mueller, 2011). This pancomputational/paninformational view is an interesting scientific endeavour as such; however, I fail to see how it will ever be able to solve the experiential and qualia aspects of conscious feeling experience as it lacks the experiential aspect of reality. As mentioned above, Chalmers

(1995) attempted to solve this through a double aspect ontology in such a way that he can keep the mathematical foundation of information theory and still get the experiential aspect at the same time. Nevertheless, I do not think he has any good arguments for how this should work and he misses the meaning process dynamics, which is inherent in Peirce's semiotics. Thus, like Peirce, I want to enlarge our wissenschaftliges concept of reality. I do not only talk about that aspect of it that can be described by physics (often reified as the physical world, turning an epistemological concept into an ontological one and reifying it), but also what can be described by life sciences, communication sciences, and psychology. Thus, reality includes at least a material environment, a living body, a life world of experience, and a social communicative world all necessary to produce experiential knowing. Science is based on intersubjectively well-functioning communication in a field of meaning coordinating knowledge and practise in the real world. I am, therefore, asking what kind of transdisciplinary ontology and epistemology we need to construct a theory of the evolution of meaning and conscious lived experience coherent with the natural, life, and social sciences?

Phenomenology and the Life World

What is the rational basis of my insistence that physical aspect of the world is not the paramount foundation of reality? It is basically acceptation of the main point of the whole phenomenological movement, the history of which Spiegelberg (1965) has made a highly recognized history of including Peirce. We will not go into that grand history here, but out of many researchers take departure in the work of the father of modern European phenomenology Husserl (1970, 1999) and the father of the American variant called phaneroscophy, namely C.S. Peirce (1958) that is also the father of the pragmatic, triadic transdisciplinary semiotics, which much of biosemiotic is built on.

Husserlian phenomenology claims that the so-called life world is a unit of reality before science splits the world into subjects and objects, or interior and exterior. The dualism of subject and object is really not essentially relevant for the phenomenological paradigms, which like hermeneutics claim to be concerned with the cognitive processes that are prerequisites for the invention of science in our cultures. This is the area where the philosophical grounding for the natural, life, and social sciences becomes relevant for the analysis.

Thus, in phenomenology the percept is a primary reality, before scientists try to explain the origin of sense perception and its information and meaning from a combination of interior physiological processes and exterior physical information disturbing the sense organs, or biology tries to explain the function of the sense organs and the nervous system from evolutionary and eco-physiological theories.

Phenomenologically, we must accept that biology cannot explain why and how we see, hear, and smell the world (Edelman, 2000, p. 222). It can only model the physiological way the organ works, but it has nothing to say about how it produces experience. This is a choking fact for a neuro- and behavioural scientist studying philosophy of science. However, it is only a problem for those scientists that have taken philosophy of science seriously and there are fairly few. Many empirical researchers do not see the problem and believe that more empirical research will solve any problem. Science will concur! I am arguing for another more philosophical reflective view here.

In phenomenology the knower, the known, and knowing is viewed as one living whole in the life world. The knowing consciousness contains the known objects (Drummon, 2003, p. 65). Thus, phenomenology considers life world experiential first-person awareness to be producing knowledge more foundational than the natural and social sciences can produce. For a traditional scientist the view is chocking. Merleau-Ponty (1962) writes:

Phenomenology is the study of essences; and according to it, all problems amount to finding definitions of essences: the essence of perception, or the essence of consciousness, for example. But phenomenology is also a philosophy which puts essences back into existence, and does not expect to arrive at an understanding of man and the world from any starting point other than that of their 'facticity'. It is a transcendental philosophy which places in abeyance the assertions arising out of the natural attitude, the better to understand them; but it is also a philosophy for which the world is always 'already there' before reflection begins—as 'an inalienable presence; and all its efforts are concentrated upon re-achieving a direct and primitive contact with the world, and endowing that contact with a philosophical status.

(Merleau-Ponty, 1962, p. vii)

Phenomenology holds that conscious experience, in both its subjective and intersubjective versions, comes before science, and is, therefore, not something that is in need of or can possibly be scientifically (materialistic or informationalist) explained. This is a direct confrontation with scientism and the physicalist philosophy that scientific knowledge is the sole foundation of a rational worldview. I think that no one has in a short form expressed it clearer than Merleau-Ponty in whose following quote the natural and the social sciences are viewed as secondary to the phenomenological stance:

Science has not and never will have, by its nature, the same significance qua form of being as the world which we perceive, for the simple reason that it is a rationale or explanation of that world. I am not a 'living creature' nor even a 'man', nor again even 'a consciousness' endowed with all the characteristics which zoology, social anatomy or inductive psychology recognize in these various products of the natural or historical process. I am the absolute source, my existence does not stem from my antecedents, from my physical and social environment; instead it moves out towards them and sustains them, for I alone bring into being for myself …the tradition which I elect to carry on.

(Merleau-Ponty, 1962, p. ix)

It is one of the clearest arguments for the necessity of philosophy when determining how to evaluate and use the knowledge from the natural and the social sciences. It is especially Husserlian phenomenology upon which Merleau-Ponty draws, which considers the life world as more fundamental than natural and social scientific knowledge, and therefore claiming that there is no scientific explanation for consciousness as it is the primary given. Consciousness is not viewed as a product of the brain or of culture and language in Husserl (1970, 1999), only its content and way of expressing itself are. On the other hand, Merleau-Ponty does not privilege the body over the mind; the body is the mind and vice versa, in that they are one whole synthesis. The phenomenological 'I' is a universal, natural, human sense-perceiving 'I' that brings things into existence for oneself through one's intentionality; this includes "the other". Merleau-Ponty writes: "Perception is not a science of the world, it is not even an act, a deliberate taking up of a position; it is the background from which all acts stand out, and is presupposed by them." (Merleau-Ponty, 1962, p. xi).

It is through being in the world and experiencing the world that we have consciousness, but that world is ontologically not the same as the "physical world" as it also includes the subjective and intersubjective world of living and communicating with other living, embodied conscious linguistic beings. Thus, the physicalistic and/or computationalist brain science, on the one hand, and phenomenology, on the other, operate in two different worlds that see the other as only describing a small part of reality that is not so important for the big picture. Both claim to be the most fundamental

description of reality. They each have their map of the world on which the other almost does not exist or is not represented in a way they will themselves accept.

One of the deepest conundrums for the sciences is the undeniable fact of our own ability to undergo qualitatively varied sense experiences, experience internal drives, urges states of feelings, and will, and to alter body processes according to that. These lead to the ability to make our body carry out goal-directed movements which, in turn, fulfil goals of which some can be bodily and psychological desires. Furthermore, this poses a very general problem for the sciences, because this experiential aspect of reality is not just a matter of the special category of human consciousness; all living beings have these abilities to varying degrees. This is one of the reasons why biosemiotics is a necessary supplement to ordinary scientific biology as well as cultural semiotics.

One can try to avoid the problem; of course, by claiming that our experience of making decisions on the basis of analysis of our qualitative experiences is an illusion or folk psychology (Churchland, 2004; Dennett, 1991, 2007) and that consciousness has no causal effect in the world as we know it. However I refuse to take eliminative materialism seriously, as I consider it to be a self-defeating paradigm, since it by its elimination denies the prerequisites for that scientific knowledge it claims to produce. Therefore, it must follow that the same science that eliminative materialism wants to credit for its arguments is also a pure hallucination without any effects on the world. Thus, we are back to pure computational paradigms or praxis and common sense utilitarianism and therefore radical social constructivism.

The position is therefore inconsistent. It ignores the fact that science has sense experience, and the ability to think, create, and communicate meaningful theories, and the ability to make purposeful experiments as a prerequisite. As Gadamer (1989) shows in his hermeneutics, science also has meaning and interpretation, based on a cultural historical horizon as a prerequisite, because it is dependent on the ability to make linguistic concepts and interpret them through one of many natural languages produced by cultures and their worldviews. That is very much the insight Kuhn's paradigm theory builds on (Kuhn, 1996). Put simply, science is a cultural product. Eliminativism is self-refuting, because the same consciousness that makes our knowledge and science possible is denied any real existence and causality in the world and as such the theory is also a bad philosophy of science much in the way radical constructivism is, as it can make no truth claims in that its philosophy of Wissenschaft denies the possibility of truth (Churchland, 2004). Another point of departure, therefore, for my argumentation is Karl Popper's Critical Rationalistic and fallibilist philosophy of science and knowing.

Popper's three worlds and evolutionary theory of knowing

The problem of knowledge goes back to the beginning of time; of the observer and of the world. Karl Popper (1972) built his general theory of evolution on Darwin's theory and tried to integrate it, consequently, with an evolutionary epistemology. Popper notes in passing that knowledge is a property of living things, and he asserts that natural selection can build primitive forms of knowledge even into single-celled organisms like amoebas.

Knowledge is something that has to be considered in a time perspective. I believe that the arrow of time and irreversibility is foundational to all human knowing, but not to computational systems. Therefore, it forces us to view the production of knowledge and consciousness not only in the subjects life time experience, but also its cultural language, knowledge traditions, historical development, and finally – not because of the unavoidability of embodiment – our living

systems evolutionary origin and ecological connectedness (Edelman, 2000).

Like Peirce, Popper saw knowledge as a subjective and intersubjective construct and underlined in his falsification theory that knowing entities can never prove - logically or through induction based on empirically collected experiences - that their general theories truly represent a universal aspect of reality. Although claims about external reality are more and less viable and work to our satisfaction for certain purposes, there is no way to prove that a claim will not be falsified the next time it is tested (Popper, 1972). However, our knowledge of the world becomes more encompassing, accurate, and useful through an iterated process of making tentative claims and empirical testing to allow erroneous claims to be selectively eliminated (hypothetical deductive method). Popper (1972) defines a living individual's knowledge as solutions, or at least claims to solutions, for its problems of life.

To allow for the subjective aspect of knowledge in an evolutionary context, Popper found it necessary to embed his theory of knowledge in the transdisciplinary ontology of three worlds. World 1 (W1) is physical reality, world 2 (W2) includes the subjective aspects of mind and living knowledge, and world 3 (W3) includes intersubjective knowledge (his understanding of objective fallibilist knowledge) that can exist over time independent of the knowing individuals, who made it. However, it that can be interpreted, modified, and used by other living individuals at other times and places.

Popper called knowledge in W2 subjective or "dispositional" in the subjective consciousness (Popper and Eccles, 1977). W3 knowledge on the other hand, could be encoded in books and documents, DNA molecules, in computer memories, and as manufactured objects. The three worlds are aspects of reality that have to interact in order to produce objective knowledge. Knowledge about W1 held by living entities in W2 can be applied to W1 via action, or it may be persistently stored in W3 in various forms for instance computer programs and model, and literary books. The reality of W3 knowledge is demonstrable when other entities decode the knowledge and can then apply it to W1 via their actions, for instance by building a piece of technology. However, Popper - in my opinion - lacked the deep understanding of living systems and the evolutionary semiotically development, which biosemiotics deals with (Emmeche, 1991, 2003). This would have provided his theory with a deeper clarity and a better justification for his ontology, and of course a theory of how communication and language are foundational to understand the intersubjective production of knowledge, as already Neurath saw as the foundation for both the natural and social sciences. In my view C.S. Piece did much of this work as we shall see (Peirce, 1958). This is, in my view, where Peirce's pragmaticistic semiotic philosophy of Wissenschaft can add value to the modern quest on the understanding of mind.

It is, therefore, one of my points of departure that natural science cannot stand alone as a kind of absolute knowledge ignoring the results of social science and the humanities. Barrow (2007) is one scientist who discusses the limits inherent in the attempts - mostly within physics - to produce theories of everything. Thus, the problem this article addresses is how to make a new paradigmatic foundation that makes it possible to integrate the knowledge of the study of embodied consciousness from the exact, the life sciences, the social sciences, and the humanities, without attempting to reduce one set of results to another. The idea is to avoid scientistic, social, and humanistic reductionism, for the reason that consciousness seems to be a transdisciplinary problem because, among other things, it is the prerequisite of science. Thus, like McGinn (2000), I think that the hard problem of consciousness is as much about what we can actually know about our own knowing and experiencing, and it is therefore also about the

limits of scientific explanation. I do not think, according to the analysis above, that "science of consciousness" is possible in the form, in which we know science now. The construction of a new and more transdisciplinary foundation for Wissenschaft is necessary. The frame work of Cybersemiotic is an attempt to develop such a new transdisciplinary, evolutionary framework that will make this new type of meaning or intentional science possible (Brier, 2008a, 2010a).

As we all know, the positivistic unity of science idea and its modern version in Wilson's (1999) *Consilience theory* is a very idealistic and reductionist attempt to establish a subject free objective knowledge. They have in my view failed in their attempts of universality, not the least in its inability to incorporate the original grounding of knowing in an experiential world of perception and emotion not to mention the problem explaining how we can decide to move our bodies from mere intensions or experiences (such as pain or pleasure) and as such create movement in our body, which indicate some kind of deep connection between mind and matter. When evolutionary theory appeared both for the living and for the dead world of nature, what Peirce calls synechism, in the form of a Cosmogony in the middle of the 19th century the paradox became worse. Because, if inert matter was first and sense experiences appeared next in evolution of life, then meaningful cognition and consciousness must have its origins in matter, the mental must spring from the development of the physical. However, that was not possible in the way we had defined those two aspects of reality in the science and humanity traditions we had developed at a time where we had not accepted evolution as a fact of the world. Presently neuropsychological studies seem to tell us very little about the nature and origin of experience, meaning, and interpretative understanding, but a lot about how brains and bodies function.

The second problem is to find a new ontological and epistemological framework that gives the possibility to integrate the knowledge we have into a bigger picture. That I am not alone in this diagnosis can be seen in works like Popper and Eccles (1977). Popper and Eccles' *The Self and Its Brain* (1977) is a good early example on attempts to change the frameworks and Thibault's (2004) *Brain, Mind, and the Signifying Body* is a more recent one.

Evolution and Teleonomy

Going a little back in history then, Jacques Monod highlighted in the famous book *Chance and Necessity* (1971) the apparent epistemological contradiction between the teleonomy of living organisms and the principle of objectivity in science based on the ontological assumption of the natural sciences that there are no intensions or meaning in inanimate nature. Monod (1971) combines scientific realism, positivism, and French existentialism in his efforts to show the contingency of human existence opposed to the religious idea of our central importance and ethical obligations in a sort of covenant with the divinely created Cosmos. Monod declares that modern science has broken the old covenant between man and nature. Today man knows that he is alone in the universe's unfeeling immensity. All science can say is that man as an inexplicable fact emerged out of the universe by chance. Neither man's destiny nor his duty is anywhere spelled out in the universe that science knows. Monod admits that science cannot explain how human beings can emerge in this meaningless and objective universe, which much of classical physics has claimed to be the whole picture of nature so long ago that we have almost forgot that it is a metaphysical decision. Thus, we are still stuck with the basic problem of explaining, how the inner world of first person experience can arise in the dead deterministic physical and closed world.

In Genesis it is God who created life, but in the paradigm of evolution, science has to explain life as something, which occurs inside the universe by virtue of the same general principles

that science uses to explain the physical and chemical aspects of the universe. Evolution is creative, constantly creating new systems, and these systems become, when they are alive, more and more creative. However, mechanical systems are not creative. This is also why C. S. Peirce (1892) does not believe that mechanical determinism can be the fundamental paradigm for science.

In the book *Order out of chaos* based on Ludwig Boltzmann's probabilistic interpretation of thermodynamics, Prigogine and Isabella Stengers (1984) developed an epistemology and philosophy of science based on a view that took complexity and irreversible evolution on the physical level serious. They, therefore, distanced themselves from the determinism of mechanics and its belief that it is possible to find some abstract and eternally simple universal, natural laws "behind" the complex forms of representations, which determine all events in the universe.

Prigogine and Stengers (1984) accept chance as real and a necessary element of evolution. In their understanding evolution requires the creation of radial new things, patterns, and phenomena that cannot be predicted from a basic physical understanding of the universe. They also realize that the acceptance of the evolutionary idea is in a fundamental paradigmatic conflict with classical physics, but perhaps not with quantum physics. However, building not the least on thermodynamics, research into complexity, non-linear systems, and fractal mathematics biology should be the science of the organizational principles that make living things living.

This is certainly a step forward, but we still lack convincing explanations of how self-organising and self-replicating entities produce life and the ability to experience. Several researchers have continued to try to explain one of the major creative elements in a "self-organizing universe" that could produce life, but the most prominent in the last 20 years has been Stuart Kauffman (1993), whose work never arrives at a theory of consciousness. Since Norbert Wiener established cybernetics and integrated information theory and thermodynamics, information scientists have tried to explain the phenomenon of life using the new concept of information, which Wiener and Schrödinger created. Their starting point was Claude Shannon's mathematics, but they redefined information from being entropy (Shannon's view) to neg-entropy; namely order and structure (Wiener and Schrödinger's (2006) view). This view has been imported into cognitive science and artificial intelligence research, looking at the human brain as an information processing system in line with the computer. However, such a framework does not give access to theories of qualia and first-person consciousness (Brier, 2007, 2008a, 2008d, 2008c, 2009a, 2009b) and in my view it needs to integrate them in its foundation before it can explain how experience, qualia, and emotions can arise from computational processes.

Changing our basic understanding of Physis

It is, therefore, clear for many researchers that an evolutionary theory of information, cognition, meaning, conscious, and communication places certain demands on the ontological presumptions of nature by science, if we do not want to bypass the results and methods of science (Küppers, 1990). Even if we believe in emergence, it is difficult to take departure in a paradigm of nature based on an ontological materialism that sees nature and the emergence of conscious man as completely determined by absolute and universal natural laws. This would defeat the whole idea of free will and destroy the vision of the human being our culture is built upon, which is a prerequisite for knowledge as a non-mechanical search for truth. Actually, a theory of emergence is not compatible with mechanical materialist determinism based on a reversible time conception and a belief in a simple ground state of things. Thus, there is no real irreversibility

and new levels of complexity as Prigogine managed to describe them in his non-equilibrium thermodynamics (Prigogine and Stengers, 1984; Prigogine, 1997).

In contrast, Prigogine, like C.S. Peirce (1892a), saw the mechanical systems as a special subclass of physical systems, not the foundation for all physical systems. Only a part of nature can be described satisfactorily this way, which the later non-linear system revolution in mathematics has shown. Most of the physical systems in nature were very complex and dynamic; maybe even hyper-complex, with a stream of energy through them developing in irreversible time into more complex dynamical states in ways not precisely predictable. Furthermore, Einstein's relativity theories told us that matter is not the physical ground state; energy is. Matter is energy stabilized in an interlocked dynamical form, a kind of a causal cybernetic circuit. Information theory's basic definition of information has been developed to be different, form and structure within contexts. Therefore, the ultimate nature of reality is often, these days, being answered to be informational and energetic processes and structures.

However, to propose a theory of knowledge, one must dare to say more about the world and its connection to the observer than it is just infinitely deep, spontaneous, chaotic, closed, and expending space-time geometry. We here see energy is getting bound up in structures we call matter (atoms) in an uneven way in the field we call gravity, who's drawing force acts like a stabile tendency to produce order in an expanding universe.

The uneven distribution of the first particles make them attract each other and when the first Hydrogen atoms are formed their mutual attraction brings them so close together that fusion processes start and make stars wherein heavier elements are created, by further fusion, up to iron. Supernova explosions create elements heavier than iron and spread the molecules out in space where then spontaneously driven by gravity and electromagnetism they create molecules. This matter collects into planets through gravity and the flow of energy from the star (sun) creates self-organizing systems far from equilibrium that get more and more complex macro-molecules. These self-organize and interact with each other in a more and more regular fashion that makes it possible to build a new system of the same kind by chemical inherence of macromolecular structures like DNA, RNA, and proteins. Membranes and Organelles spontaneously self-organize and combine into cells.

However, the incoherent jump in the theory is that now they are suddenly living, while the rest of the objects, we have mentioned, have been physical or chemical only. Different forms of cells combine into the modern complicated cell with many different organelles like mitochondria and Golgi apparatus. The cells combine into multi-cellular living systems. Later, organs emerge, some of them sense-organs; the combination with a nervous system suddenly makes sense-experience possible. But how? Sensing systems can be used in robots to orient the systems related to other structures in the environment with suitable structural couplings as Maturana calls them (Maturana, 1983). One can say that these robots, functionally defined, see (if we focus on the visual sensing for a moment), but they do not see in an experiential way. Therefore, the hard evolutionary question is, from where in the received view of physical cosmogony, chemical, and then biological evolution does the ability to sense experiences and be aware emerge? As Emmeche (1991) shows none of the accepted forms of emergence deal with how experiences arise from matter through self-organization. We must further theorize how the processes of cognition and communication develop beyond their basis in the perturbation of and between closed systems to a theory of feeling, awareness, qualia, and meaning.

The German system theorist Niklas Luhmann was inspired by Maturana and Varela's theory of autopoiesis, extended the autopoietic model to the psychological and the socio-communicative level (Maturana and Varela, 1987). Luhmann (1990), thus, generalized the theory of autopoiesis and from this abstract model he derived a triple autopoiesis model, where both the biologic and psychic systems are silent and only the socio-communicative in its autopoietic form can communicate. Biological autopoiesis functions in the medium of life, and the psychic autopoiesis plus the socio-communicative function in the medium of meaning. Thus, communications are autopoietic systems. Luhmann's provoking punch line, "Only communication communicates!", is a meta-biological perspective that processes meaning without intentionality, but from a horizon of expectancies. Luhmann writes:

communication is a completely independent, autonomous, self-referentially closed selections, a mode of constantly changing the forms of meaning material, of reshaping freedom into freedom under changing conditions, whereby (given the premise that the environment is complex enough and not ordered as pure randomness) experiences of reliability gradually accrue and are then re-included in the process. Thus a meaning world emerges through epigenetic evolution that makes possible communication that is less probable.

(Luhmann, 1995, p. 149)

Science has shown us, that reality is very complex and the data we have empirically collected can be interpreted in many ways. There are many competing valid interpretations that are negotiated in the many research communities. We cannot expect a common worldview. We have to negotiate a mutual understanding to find a common working definition. Luhmann writes:

If one conceptualizes communication as the synthesis of three selections, as the unity of information, utterance, and understanding, then communication is realized if and to the extent that understanding comes about. Everything else happens "outside" the unity of an elemental communication and presupposes it. This is especially true for a fourth type of selection: for the acceptance or rejection of the specific meaning that was communicated.

(Luhmann, 1995, p. 147)

Embodied cognitive science says that some basic part of the common understanding that is the prerequisite for the selection results from the interaction between body and mind in the process of surviving and preserving the body-mind's organisation of the individual living beings. Contrary to dead things, living systems are individuals, and this is the basis for the ability of humans to become a person in a culture. Loet Leydesdorff writes:

From the perspective of cultural studies and critical theory, Luhmann's communication-theoretical approach in sociology can still be read as a meta-biology: while biologists take the development of life as a given, Luhmann tends to treat the development of meaning as a cultural given.[1] Meaning is no longer considered as constructed in communication, but meaning processing precedes and controls communication as an independent variable.

(Loet Leydesdorff, 2012, p. 1)

Habermas (1987) made the argument about this meta-biological foundation of Luhmann's systems theory most forcefully:

In this way, subject-centered reason is replaced by systems rationality. As a result, the critique of reason carried out as a critique of metaphysics and a critique of power, which we have considered in these lectures, is deprived of its object. To the degree that systems theory does not merely make its specific disciplinary contribution with the system of the sciences but also penetrates the lifeworld with its claim to universality, it replaces metaphysical background convictions with metabiological

ones. Hence, the conflict between objectivists and subjectivists loses its point.

(Habermas, 1987, p. 385)

I agree with Habermas that the problem here is where the first person experiences belong in the intersubjective basis for communication, the social, and culture. How do systems go from being able functionally to orient themselves in relation to environmental structures and other members of the species to have sense-organs giving sense-experiences and constructing an "I"? Moreover, how does the intersubjectivity of communication, language, and knowledge emerge? In a way on can say that intersubjectivity precedes objectivity in the world, because the world is represented within the intersubjective knowledge through language. Luhmann considered human actors as consciousness systems, which are only the environment of the social system, which he saw as communication, and therefore replaced Husserl's concept of 'intersubjectivity' with communication-theoretical concepts like self-organization (Leydesdorff, 2009, p. 7).

However, when it comes to the qualia of subjective consciousness Searle (1989) argues that the secret must lie in biology. As far as we know, it is only biological systems that produce nervous system, and central nervous systems that create awareness, feeling, sense-experience, and qualia. Nonetheless, biologists insist on describing their subject area in chemical and physiological term and consider molecular biology to be the greatest advantage since Darwin. The vitalism debate has ruled out that there are any differences in the nature of the molecules inside and outside living systems. Thus, the received view in science is that the only difference between pure physical and living biological systems is the way the molecules are organized. However, how should that create the difference, which produces consciousness?

In the received view of modern biology it is presumed that over a long period of variation and selection of functional macromolecules, autocatalytic ribozymes develops, which again develops catalytic abilities as templates for polymerization of polypeptides. This would then, over a long period of time, result in the precise tri-nucleotide "codes" (the term "codes" is used much in informational biology, but codes is a term that comes from something conscious human beings make to connect two different systems such as the Morse code and the letters in the alphabet. But how can systems that do not have any consciousness, intentions or subjectivity devise 'codes'?), which are used in DNA in all present organisms to determine specific amino acids to be produced by the ribozymes. What is often called "encoding" of information into the DNA through the evolutionary process is actually done by the environment through the processes of "blind variation" and the selective elimination of erroneous variants.

Once autopoietic reproduction begins, natural selection becomes possible, and survival knowledge - in the form of structural couplings readiness to act in an orderly way on certain disturbances from the environment - begins to emerge and grow. These autopoietic structures that are connected to the ability to produce their own macromolecules create "semantic closure". Solutions to survival problems are kept as a kind of reaction potentials within the organism, some of it as molecular structures in the DNA-RNA-protein-synthesis processes. This enables the system to perpetuate its autopoiesis from one instant to the next through generations of self-production as a full-bodied individual and self-reproduction. Hoffmeyer and Emmeche (1991) call it code duality. The analogue code is the actual living body as phenotype and the digital code is the genotype of the genome. These two codes then interchange over time.

Recently Marcel Barbieri (2009, 2011) has pointed out that there actually is a difference in molecules inside and outside the living systems.

This difference is caused due to the fact that many of the proteins, which are constructed by the DNR, RNA, and ribosomal protein synthesis machinery, are not found outside living systems at all. They are not spontaneously produced in the star dust as so many of the living systems' other vital molecules. These special proteins are only produced inside living systems composed of at least one cell. Thus, Barbieri concludes that life is then partly based on artificial molecules, which the living systems' autopoietic machinery has created and keeps reproducing on a regular basis.

Thus, in the beginning, "knowledge" exists only as embodied in the inherent structural dynamics of the autopoietic entity. But is it knowledge defined without life and sense experience? I would not say that a robot has knowledge, as many computer scientists do. Autopoiesis in itself is not sufficient as a theory for defining experiential life. On the other hand, it is very open for a sort of bio-constructivism that is against any mechanical objectivistic materialist realism.

I argue here that knowledge needs an experiential component added to the functional, since sense experiences and awareness are usually not part of the biological story of the development of life and knowing. Thus, structural couplings in autopoiesis theory, affordances a la Gibson and Uexkull's tones are all important parts of a pragmatic evolutionary understanding of cognition, but this is not enough to make a theory of the emergence of experiential mind in evolution.

Surviving entities in the course of evolution are those where the heritable structures of their DNA molecules contributed to solving survival problems. However, how exactly this should happen as a mechanical process, we do not know. Nonetheless, the general idea is that starting from random noise the autopoietic functions of the cell make possible the selective filtrate for useful functionality. As such, researchers often say that this process has gradually built knowledge of the world into the DNA sequence; but, how and what kind of knowledge?

Barbieri (2011), in a crystal clear article, sees the parallel between the problem of the emergence of life from the physico-chemical world and the emergence of experience from the self-organization of the living systems. To him the production of new codes can solve both. Life is built out of new artificial molecules assembled by the DNA, RNA, and Ribosomal apparatus combining amino acids in new inventive ways. The solution to how the ability to experience emerges from the brain of mammals' production of new brain codes, which generates the brains ability in sense experience, emotions, and imaginary abilities. Barbieri in his most interesting grand theory of code-semiotics writes:

The idea of a deep parallel between life and mind leads in this way to a parallel between proteins and feelings, and in particular to a parallel between the processes that generate them. We already know that the assembly of proteins does not take place spontaneously because no spontaneous process can produce an unlimited number of identical sequences of amino acids. The Code model of mind is the idea that the same is true in the case of feelings, i.e., that feelings are not the spontaneous result of lower level brain processes. They can be generated only by a neural apparatus that assembles them from components according to the rules of a code. According to the Code model, in short, feelings are brain-artifacts that are manufactured by a codemaker according to the rules of the neural code. In the case of proteins, the codemaker is the ribonucleoprotein system of the cell, the system that provides a bridge between genotype and phenotype. It receives information from the genotype in the form of messenger RNAs and assembles the building blocks of the phenotype according to the rules of the genetic code. It must be underlined; however, the codemaking system has a logical and a historical priority over genotype and phenotype, and for this reason it

is the third category that has been referred to as the ribotype of the cell.

In the case of feelings, the codemaker is the intermediate brain of an animal, the system that receives information from the sense organs and delivers orders to the motor organs. The sense organs provide all the information that an animal is ever going to have about the world, and represent therefore in an animal what the genotype is in a cell. In a similar way, the motor organs allow a body to act in the world, and have in an animal the role that the phenotype has in a cell. Finally, the intermediate brain is a processing and a manufacturing system, an apparatus that is in an animal what the ribotype is in a cell.

The parallel between life and mind, in conclusion, involves three distinct parallels: one between proteins and feelings, one between genetic code and neural code, and one between cell and animal code making systems. The categories that we find in the cell, in other words, are also found in animals, because at both levels we have information, code and codemaker. The details are different, and yet there is the same logic at work, the same strategy of bringing absolute novelties into existence by organic coding.

(Barbieri, 2011, p. 380)

However, in a later section, the article shows that Barbieri thinks of sense experience as modeling. It certainly is, but in my phenomenologically informed view a qualitative different kind. Barbieri writes:

The results of brain processing are what we normally call feelings, sensations, emotions, perceptions, mental images and so on, but it is useful to have also a more general term that applies to all of them. Here we follow the convention that all products of brain processing can be referred to as brain *models*. The intermediate brain, in other words, uses the signals from the sense organs to generate distinct *models* of the world. A visual image, for example is a model of the information delivered by the retina, and a feeling of hunger is a model obtained by processing the signals sent by the sense detectors of the digestive apparatus.

(Barbieri, 2011, p. 388)

Barbieri uses the modelling idea expanded on by Sebeok and Danesi (2000). It is a good "functionalist approach" catching important practical aspects of reality. However, when I make a model of the route I have to follow to get home from a new place in town, I actually visualize the streets. I see them and thereby experience them. I make the images for my "inner eye" and draw on my lifetime's memory of this town, which I have lived in my whole life. It is not just a logical map, which directs my way home. It is an embodied experience. It is qualitatively different from what such a map is to a robot, not the least because I have the free will to choose not to follow it and change the route. I am not, in any automatic way, determined to follow it. Clayton (2004, p. 601) also argues that the emergence into the quality of experience is different from other emergence theories.

Konrad Lorenz (1971) tried to develop an alternative to behaviourism's mechanical paradigm in the form of a bio-psychological science which he called ethology. If you follow his work on the theoretical development of the new paradigm it is obvious that after a long struggle with the problem he failed to integrate the inner phenomenal world with the new biological behavioural science of ethology, a fact also pointed out by Hinde (1970) (Brier, 1980). Biology has yet not been able to produce a concept of qualia or intentionality. Ellis (1998), and Damasio (2000, 2004) have pointed to the importance of emotions for the understanding of cognition, communication, and behaviour. However, none of them has managed to make a deep theoretical ontological foundation for a new way to integrate first, second, and third-person views on embodied intersubjective

linguistically interacting conscious minds and embodied brains.

Barbieri (2011) attempts bravely to solve this with a new code-semiotic paradigm; building neither on information theory nor on Peirce's semiotic philosophy. In the regime of computer codes AI researchers in hard A-life often believe that the agents they can create in computers are compatible to living agents (Emmeche (2013) criticize this). However, many A-life researcher do not see any special abilities in living systems other than complexity. Still, Peircean biosemiotics considers that it is the combination of cells into specialized organs to registries perturbations in the physical chemical environment that gives rise to sense experiences that can make a difference. A difference cannot become knowledge before it has been interpreted to be so meaningful and important that an individual observer/knower in a species or a culture attaches a sign to it. Then, it will make a difference (Bateson, 1972). However, biology has not solved the question of how this is possible and neither has computer science, and Barbieri seems not to have developed this aspect of his new code-biological paradigm in any explicit way

Biosemiotics suggest that what are transferred in and between living systems are signs, not objective information. Signs have to be interpreted, and it has to happen on three levels. On the most basic level we have the basic coordination between the bodies as a dance of black boxes to allow for meaningful exchange. This goes on at the next level of instinctual sign plays of drive and emotionally based communication about meaningful things in life, like mating, hunting, dominating, food seeking, territory, and etc. Barbieri (2011) distinguishes between a cybernetic and instinctive aspect of the brain function and believes that the emotions emerge from the instinctual brain. I agree on this, but cannot see that he solves the problem Konrad Lorenz (1971) could not crack in his creation of the ethological paradigm (Brier, 1980 and 2008c). Based on these two levels a new third level of meaning is created that the socio-communicative system can modulate to conscious linguistic meaning.

Cognition is socially distributed, bio-physically embodied, and culturally embedded. Moreover, there is an integration of the praxis of communication with the praxis of living, of language games with life forms and of the communicative competence with a general socio-cultural competence. An instrumental-pragmatic view of linguistic communication conceives of linguistic-symbolic behavior and the use of tools (technology) co-evolutionary. Donald (1991) and Nelson (1998), believe that it all started with homo erectus' mimetic mind and culture. It was characterized by re-presentational and re-enactional intentionality in the use of fire to cook their food, and the institution of the sharing of food among family members. This is assumed to be the start of phatic communion and the development of symbolic codes. Mimesis can be seen as the outgrowth of the primary, proto-semiotic, reflexive stage of languaging, which is securing coordination and community in the general primate episodic mind and culture. Here we go some three million years back (Donald, 1991). Mimesis is a precursor to the symbolic stage, with its social, communicative, re-enactment side and its individual, cognitive, re-presentational side. Mimesis stages would be from images over diagrams, to metaphors According to Donald's evolutionary theory (Donald, 1991), metaphoricity would include primitive 'narrativity' and develop that further producing a mythic stage in the Paleolithic epoch of the Stone Age about 35,000 years ago. Narrative skills are a fundamental part of the communicative competence of modern man, homo sapiens. 'Narrative thinking' in the form of mythos is prior to 'paradigmatic thinking' of analytic thinking, which is the characteristic of the theoretical but empirical scientific type of thinking and explanation. Meaning narratives

are a prerequisite for objective science. How do we integrate that knowledge, if not by including semiotics as biosemiotics in our knowledge foundation?

Why Brain and Experiental Consciousness Data Do Not Fit

When I think of the problems of interpreting the results of brain research into our social life world of experiential awareness and meaningful language games' existence in their life forms, I think the poem below of the knowns and unknowns is a good metaphor of our problem of formulating the problem:

The Unknown

As we know,
There are known knowns.
There are things we know we know.
We also know
There are known unknowns.
That is to say
We know there are some things
We do not know.
But there are also unknown unknowns,
The ones we don't know
We don't know.

(Donald Rumsfeld Feb. 12, 2002, Department of Defence news briefing poem)

Many researchers think that we just have a "hard problem" of how brains produce awareness, experience, and even self-consciousness. Many scientists think that we just need to find a good chemical or computational description of the processes between what we can see through brain and neuro-science and what we can report from our own "inner" experiences. Therefore, it is just an unknown that we know that we do not know yet, when we look at it from cognitive brain science.

The information and computational cognitive scientists think they can explain this connection as computation. In the beginning, it was on the basis of the Turing machine theoretical concept of algorithms. Thus, it was based on an ontology of the world as a sort of Turing machine that can compute by algorithms. However, in the last couple of years it has been more widely acknowledged that this foundation is too narrow to be able to explain the emergence of experience and awareness. Researchers, therefore, are now trying to broaden the concepts of computation and information into a theory of natural info-computation partly based on the visions of Gregory Chaitin's (2010) meta-mathematics, where he attempts to view mathematics as a biological process (G. Dodig-Crnkovic, 2010; Dodig-Crnkovic & Müller, 2011). I still fail to see how this paradigm of pan-informational and natural computation can solve the problem as there is no indication of computational systems producing awareness and qualia (Brier, 2010a; Emmeche, 2001). I think that Emmeche here shows that the epistemology is too simple, and the ontology stipulated - which has now a combination of energy/matter, information, and computation as its foundational entities - is unable to include a phenomenological and first-person perspective theoretically. Thus, I think our situation is worse than operating strategically with solving a known unknown.

I think the background for the hard and the binding problem is an unknown unknown, like the dark matter problem in physics. By that I mean that the problem is not recognized by the ruling paradigms in the area and formed in a straight forward way that their "Normal sciences" can deal with it empirically (Edelman, 2000; Kuhn, 1996).

The reason for this is partly based on almost incommensurable communication. Because physics and chemistry, on the one hand, combined with information and computational based cognitive brain and linguistic science, versus phenomenological and hermeneutic paradigms have very different implicit ontologies and epistemologies (Brier, 2008a). I think the present attempts to naturalize phenomenology show that many researchers try to find another

connection than the info-computational one to the problem (Petito, Varela, & Roy, 1999). However, I think these researchers underestimate the radical nature of the problem if they think there is a simple road from science to phenomenology (see Heelan, 1987).

Still, one of the most esteemed philosophers of physicalism, Kim (2007), recognizes the problem of qualia and mental causality to be the two most severe impediments to a physicalist philosopher of science's ability to develop a full-blown physicalism. How are experiences and subjectivity going to be explained by absolute natural laws working on inert matter? One obvious strategy is to invent two independent worlds for mind and matter in a dualism like Descartes'. We have worked with this idea for centuries and it paved the way for neuroscience. However, as Damasio writes in *Descartes Error* (1994), most researchers to day have realized that Descartes' dualistic solution to this problem does not solve the problem. First of all, because it is impossible to see how any interactions between Res Extensa and Res Cogitans could be possible unless one believes in a pre-stabilized harmony, as Leibniz (1898) did, and combines it with a double aspect theory like Spinoza's, Which is pretty much what Chalmers and Damasio have done (Chalmers, 1995,1996; Damasio, 2004) . However, in that case, mind and matter would be tied together as two aspects of the same reality and governed by absolute deterministic laws or the will of God. That would then leave the experiential domain in the same form of absolute determinism by general laws as the physical domain in the way it was conceived by classical mechanical physics. This would eradicate free will - many like Libet (1993) try to show that concept is an illusion - and thereby the independent decision power of the subject. It would destroy the foundation of the self-same science that was supposed to give the arguments weight. Thus, we would find ourselves in another vicious circle of arguments. As Kant argues:

> It is as impossible for the subtlest philosophy as for the commonest reasoning to argue free will away. Philosophy must therefore assume that no true contradiction will be found between freedom and natural necessity in the same human actions, for it cannot give up the idea of nature any more than that of freedom.
>
> *(Kant, 1909, pp. 75-76)*

As Kultgen (2009) argued that it is important that both Peirce (ibid), and Whitehead and Griffin (1978) thus deny Kant's (1909) absolute distinction between nature and freedom accepting a sort of process philosophy instead. To Peirce, nature has spontaneity and pure chance at its basis in Firstness and reasonability in Thirdness. Peirce denies the distinction between the phenomenological and the noumenal (understood as the thing in itself), because this idea of the incognizable appears as a null-term of theoretical and practical thought. For Peirce, the real is wholly open to our pragmatic observation and thinking, and there is no absolute difference between objects of theoretical and practical thought. Metaphysics is seen as an observable ideal limit of empirical enquiry (Kultgen, 2009, p. 288). Thus, Peirce makes a full naturalization of all possible knowing in the universe including the subject and the intersubjective phenomena. This is a philosophical move that modern American philosophers, like Sellars, McDowell, and Brandom, are known for developing. Robert Brandom (1994) recently declared that Wilfrid Sellars is the greatest American philosopher ever since Charles Sanders Peirce. Peirce was a great inspiration to Sellars. Like Peirce, Sellars (1991) wanted to move analytic philosophy from its Humean into its Kantian phase. It is a move beyond classical empiricism and naturalism or from logical empiricism to logical Kantianism. Peirce, like Sellars, thought the task of philosophy was to provide a 'synoptic' view of how things in the broadest possible sense of the term hang together. How does our common sense outlook

fit into our increasingly fine-grained scientific outlook? How can we make our perception of a blue wall compatible with the same phenomenon described by particle physics?

Both Peirce and Sellars view our non-scientific ways of thinking as being indispensable not only for knowledge but as the very basis for perception and thought. The problem is that empiricist philosophy says that our ideas come from direct experience of things. The 'myth of the given' - as Sellars' problem that Peirce also was aware of - is the claim that individual pieces of data can be known directly, that is, without any knowledge of associated concepts. The problem is: how can I say I know what "red" is from the fact that some things look red to me? In both Peirce's and Sellars' view, in order to say anything 'looks blue', we would already require the abstract universal concept of 'is blue'. It is a basic philosophy as well as philosophy of empirical science problem that we need universal concepts to distinguish one color from other colors, or one taste from another. This means that the model of the world out there, which empirically based science produces, is lacking an integrated reflection on the self-same consciousness that produced the science by which we attempt to make a causal model of the self-same consciousness.

My suggestion is that to avoid a strange loop in argumentation we may modify and enlarge our idea of nature. Truth is only mechanical in the formal and abstract world of logic, but it is not so in the concrete world. Here the truth of general theories or even theories with universal aspirations cannot be proved in the ordinary mathematical and logical use of the concept. As mentioned, Penrose (1999) also argues convincingly that important aspects of human consciousness are non-algorithmic. This means that consciousness is not capable of being modelled by a conventional Turing digital computer. Thus, a pan-computational paradigm on this basis will not be able to encompass consciousness. To go from Cartesian dualism to modern pan-computational informationalism does not solve the problem either. There is a weak possibility if one changes the concepts of computation and information considerably from the scientific one we have today; indeed Dodig Crnkovic and Mueller have initiated the development of such a new paradigm (Dodig Crnkovic, 2010; Dodig Crnkovic & Mueller, 2010). Stephen Wolfram (2002) has announced *A new Kind of science* based on a theory of Strong computational universality for complex systems. It was not Wolfram but Konrad Zuse who was the first to suggest that the physical universe is being computed on a discrete computer, such as a deterministic cellular automaton. His first paper on this topic dates back to 1967 (Zuse, Raum, & Datenverarbeitung, 1967, vol. 8, pages 336-344). Many develop the computational concept deep into quantum physics to get to another sort of computational foundation of reality called qubits like Deutsch, who writes: "Boolean variables, and classical computation are all emergent or approximate properties of qubits, manifested mainly when they undergo decoherence" (Deutsch, 2013, p. 93). He continues:

> The world is made of qubits. Every answer to a question whether something that could be observed in nature is so or not, is in reality a Boolean observable. Each Boolean observable is part of an entity, the qubit, that is fundamental to physical reality but very alien to everyday experience, it is literally not of this universe … What we perceive to some degree of approximation as a world of single-valued variables is actually part of a larger reality in which the full answer to a yes-no question is not just yes or no, nor even both yes and no in parallel, but a quantum-observable – something that can be represented as a large Hermitian matrix.
>
> *(Deutsch, 2013, p. 100)*

Nonetheless, even when trying to go this deep into a quantum-computational foundation for reality as John Archibald Wheeler (1998) also does, I cannot see how any of them can avoid

phenomenology and the meaning question of the observer so important to quantum physics, if they do not shift at least to a biosemiotics. Emmeche (2013) realizes that a broader idea of ontology is necessary and describes qualitative organicism as one way of making a broader ontological stipulation and making experience a part of objective reality. He writes:

Qualitative organicism

This is a more radical position differing from main stream organicism in its appraisal of teleology and phenomenal qualities. It emphasizes not only the ontological reality of biological higher level entities (such as self-reproducing organisms being parts of historical lineages) but also the existence of qualitative experiential aspects of cognitive behavior. When sensing light or colors, an organism is not merely performing a detection of external signals which then get processed internally (described in terms of neurochemistry or information processing); something more is to be told if we want the full story, namely about the organism's own experience of the light. This experience is seen as real. It may be said to have a subjective mode of existence, yet it is an objectively real phenomenon.

(Emmeche, 2013, p. 117)

I think it is a major point to realise subjectivity is an objective fact. It is real and therefore a part of reality or the real world. My main problem with the standard materialistic scientific evolutionary paradigm is that I cannot see how physics – as an external science – on the basis of the present definitions of matter, energy and deterministic law, can ever alone furnish us with the final understanding of our inner lives and how consciousness arises. When working from an evolutionary view, combining the Big Bang theory with self-organizing thermodynamics and chemistry, add Darwinism for biological systems, and proceed with a somewhat materialistic theory of the development of the history of language and the culture of man, and there still remains the severe problem of explaining consciousness as this inner quality of perception, feeling, volition, and cognition that we all experience. I do not see quantum physics, the general relativity theory or non-equilibrium thermodynamics as being of any particular help concerning this problem, although they may be helpful to explain the physical aspect of consciousness (Penrose, 1989). This is my argument of why a bottom up, empirically based physicalism or pan-computationalism is inadequate to solve the gap problem. Here is it that Peirce's theory of the tendency to take habits - what he calls Thirdness - brings the physical and the mental together in that he sees the tendency to take habits in both nature and mind. Here is one of those deep quotes of Peirce arguing with the mechanical view of natural law:

The law of habit exhibits a striking contrast to all physical laws in the character of its commands. A physical law is absolute. What it requires is an exact relation. Thus, a physical force introduces into a motion a component motion to be combined with the rest by the parallelogram of forces; but the component motion must actually take place exactly as required by the law of force. On the other hand, no exact conformity is required by the mental law. Nay, exact conformity would be in down-right conflict with the law; since it would instantly crystallize thought and prevent all further formation of habit. The law of mind only makes a given feeling more likely to arise. It thus resembles the "non-conservative" forces of physics, such as viscosity and the like, which are due to statistical uniformities in the chance encounters of trillions of molecules.

(Peirce, 1892b, CP 6.23)

This is why Thirdness is so important in Peirce's categories and at the same time it is critical to remember that Thirdness includes Secondness and Firstness. We will return to that below.

The Cybersemiotic transdisciplinary accepts Peirce's view and sees scientific explanations as

going from our present state, of socio-linguistically based conscious semiosis in self-organized autopoietic systems, towards a better understanding of the prerequisites of language and the self-conscious being. Science gives good economic and practically useful understanding of certain processes, often in a way that allows prediction with a wanted precision within certain circumstances. However, it does not give universal explanations of the construction of reality, energy, information, life, meaning, mind, and consciousness. Natural science only deals with the outer material aspect of the world and our body, not with experiential consciousness, qualia, meaning, and human understanding in its embodiment (Edelman, 2000, pp. 220-222).

Being in the world, in languaging, embodied in a meaningful social context we instead have to start 'in medias res' (centre of the Cybersemiotic star). We will always be bound to make some metaphysical presumptions based on our present understanding and they will always show later to be too limited. However, Peirce's semiotics is a very good non-reductionistic framework to start from, since it takes its point of departure in semiotic mind.

Today, it is widely recognized that what we call a human being is a conscious social being, living in language. Terrance Deacon (1998), in his book *The Symbolic Species*, sees language-processing capacity as a major selective force for the human brain in the early stages of human evolution. We speak language, but we are also spoken by language. To a great degree, language carries our cultures as well as our theories of the world and of our selves. As individuals, we are programmed with language – to learn a language is to learn a culture. As such, pre-linguistic children are only potentially human beings, as they have to be linguistically programmed in order to become the linguistic animal cyborgs, we call human. However, getting behind language as such is difficult without creating a broader platform beyond linguistics. Peircean semiotics and its modern evolution to a biosemiotics is such an attempt for a doctrine of cognition and communication, and therefore creating of knowledge in the widest sense.

Biosemiotics: The Connection between Meaning, Rationality, and Nature

Damasio writes that: "Nature appears to have built the apparatus of rationality not just on top of the apparatus of biological regulation, but also *from* it and *with* it." (Damasio, 1994, p.128). He agrees with Peirce here. Mind cannot exist or operate at all without a body, which we saw Merleau-Ponty emphasize above. However, something more, which we still seem to be unable to unravel, is necessary to produce mind. Damasio writes:

> Brains can have many intervening steps in the circuits mediating between stimulus and response, and still have no mind, if they do not meet an essential condition: the ability to display images internally and to order those images in a process called thought.
>
> *(Damasio, 1994, p. 89)*

Damasio puts forward an interesting theory of 'somatic markers'. Here, "dispositional representations" set off chains of reaction that reach deep down into the body's accumulated experience and bring forth images of appropriate visceral content intermingled with emotional states, which color everything with moods that regulate our attention and interest. It is a fecund insight, which was already foretold in the work of Konrad Lorenz (1971) –in his attempt to build the biological behavioural science of ethology (see Brier, 1980, 1999, 2000, 2001). But still, neither Lorenz nor Damasio reveal how the body produces experience as such. The most rudimentary biological cognitive processes of animals with perceptual organs involve the ability to make distinctions.

Any type of distinction must be able to sort differences that do not make a difference from

differences that do in matter of life and death. Thus, the organic is not deterministic or even probabilistic. It is an autopoietic, organizationally cybernetically closed individual able to respond to disturbances in a productive way for survival (Maturana, 1980; Maturana & Varela, 1987). As such the life sciences are qualitatively different from the exact science like physics and chemistry. Molecular biology and genetics in themselves do not explain the nature and quality of life and how living systems' experiential qualities come about. All we know is that the computational systems we have built so far are not able to produce an experiential world. Haikonen (2009) gives a convincing analysis of the huge problem the phenomenon of qualia creates in the quest of producing conscious machines (see also his book on conscious machines; Haikonen, 2007)

In the literature on biological systems it has for a long time been assumed that the use of the terms "difference", "information", "message", "signal", "communication", "messenger", "message" "cue", "code", "sign", and "meaning" were practical, metaphorical shorthand; but if so, why do they persist and proliferate in scientific articles? One of the points of departure for a biosemiotics is to take this "information talk" seriously and develop them into a common framework (El-Hani, Queiroz, and Emmeche, 2006, 2009). The so-called central dogma in biology postulates a uni-directional flow of "information" from DNA to protein. Scientists hoped that these terms would be effectively reduced to chemical and physical interactions, or at least viewed as computational physical informational processes. Some of these phenomena are instead evaluated in biosemiotics as embodying sign processes, because genetic and biochemical information has shown to be highly context and time dependent. This means that "information" in biological systems is not simple objective "data", but has to be interpreted in a situated context by the cellular or multi-cellular system in order to yield meaning (Kauffman et al., 2007). The simplest such semiotic process is not only the ability of single cells to categorize environmental objects from superficial properties, but also internal exchanges between organelles. E. Coli, for instance, is able to recognize carbohydrates by an active site on the macromolecule. Thus, the active site stands as a code for the whole carbohydrate molecule. This makes it possible for the same kind of active site on another type of molecule – such as artificial sweeteners – to fool the bacteria, just like human beings are fooled by sweeteners in their unhealthy hunt for sugar.

The creative capacity of molecular-biological codes to be interpreted in meaningful ways expresses a generative capacity that is outside the terminology of the molecular-biological language. This example also shows that even at this level of life, a sign is what makes lying possible, as the signs stand for something for someone even though what they stand for need not be present. It is a new level of freedom, indeterminism, and risk. Here, context of living becomes vital for interpreting and survival. There is no meaning without a life context and no context determined without meaning. They are bound together by a cybernetic semiotic loop. As the organism is responding to more of the present situation it reaches deeply into the future and the past and into its construction of its own 'signification sphere' (Signification sphere is a concept of Cybersemiotics in the form of a Peircean reinterpretation of Jacob von Uexküll's concept of the animal's "Umwelt" (See Brier, 1995, 2011)). As anticipation unfolds, variation, plasticity, versatility, and adaptability grow, and semiotic freedom in the form of the enhanced ability to engender new concepts and cognitions, which go beyond the genetically determined forms of perception in reflexes and instincts, develops (Hoffmeyer, 2008).

The basic reason for developing biosemiotics is thus the ontological postulate that biology is already semiotic. The living world is literally full of organic codes – such as DNA, messenger and transport RNA, ribosomal RNA codes,

hormones, transmitters, immunological codes, and etc. - and they are associated with all great events of macroevolution from the origin of proteins all the way up to the origin of embryos, the origin of mind, and the origin of language (Barbieri, 2001, 2006). Not only does life create these semiotic capacities, but also it creates the capacity to create new codes with new semiotic capacities (Barbieri, 2010). Codes and signs cross the old boarders between nature and culture, between causality and signification, and between interaction and communication. Biosemiotics suggests developing a reflected semiotic theory of the origin of life, agency, modelling, coding, semiosis, sense perception, conscious awareness, and communication. However, it is seldom truly Peircean. As Emmeche (2013, p. 119) - in my view correctly - argues and sees, mainstream biosemiotics has to build on an organismic emergentism.

For me, this is a problematic platform to use Peirce's semiotics from, as its workings are dependent on its paradigmatic triadic phaneroscopic formulation of an ontological framework. This includes synechism, which is also close to Whitehead and Griffin's (1978) thinking, namely that the world is a plenum, or a field, where everything is connected to everything else in a hyper-complexity. Much like the one we find in the mathematical line, where a new cut can always be inserted between two points no matter how refined they are defined. It also means that all knowledge is fallible - it cannot be proven true. In Peirce's words:

The principle of continuity is the idea of fallibilism objectified. For fallibilism is the doctrine that our knowledge is never absolute but always swims, as it were, in a continuum of uncertainty and of indeterminacy. Now the doctrine of continuity is that all things so swim in continua….

(Peirce, CP 1.171)

In the famous articles "The Fixation of Belief" or "How to Make Our Ideas Clear," Peirce discusses convergence of different lines of inquiry as a sign, from which inquirers hope to draw near to the truth. Such a sign is inconclusive, though. It involves belief that the inquiries have been healthy, open, critically examining everything, and etc. The interdisciplinary research project of biosemiotics is attempting to re-open the dialogue across the life sciences and the humanities about what terms such as "meaning" and "significance" might refer to in the context of living systems. It does this by treating life as continuous and by discerning semiosis across the realm of nature and culture, and by accepting that organisms are agents who co-construct the world and themselves, are linking genetic code sequences, through intercellular signalling processes evolving to animal motivated perception with cognition and communicative display of behavior in humans. Communication finally develops by the use of grammar and abstract symbolic thought of representation, meaning and sense into linguistic communication. For the Peircean semioticians all this is done in the basic aspect of life that Peirce calls "Firstness" or feeling and which co-occurs with 'possibility' in his phaneroscophy. Peirce defines Firstness in this way:

The idea of the absolutely first must be entirely separated from all conception of or reference to anything else; for what involves a second is itself a second to that second. The first must therefore be present and immediate, so as not to be second to a representation. It must be fresh and new, for if old it is second to its former state. It must be initiative, original, spontaneous, and free; otherwise it is second to a determining cause. It is also something vivid and conscious; so only it avoids being the object of some sensation. It precedes all synthesis and all differentiation; it has no unity and no parts. It cannot be articulately thought: assert it, and it has already lost its characteristic innocence; for assertion always implies a denial of something else. Stop to think of it, and it has flown! What

the world was to Adam on the day he opened his eyes to it, before he had drawn any distinctions, or had become conscious of his own existence - that is first, present, immediate, fresh, new, initiative, original, spontaneous, free, vivid, conscious, and evanescent. Only, remember that every description of it must be false to it.

(Peirce, CP 1.357)

Possibility and potentiality is thus found in Peirce's category of "Firstness" as it is in the complexity science behind non-equilibrium thermodynamics and in the vacuum fields behind quantum field theory. The problem is how the modality of possibility, which is so vital for evolutionary thinking in physics, chemistry, biology, and sociology, can function in a non-reductionistic and non-scientistic view of a developing cosmos (Deacon, 2007, 2008). In contrast, with all other theories of self-organizing evolution, Peirce's view of Firstness as both possibility and pure feeling provides organisms with the ontological conditions for felt qualitative experience to emerge in autopoietic systems (Brier, 2004, 2007). A non-reductionistic view of the cosmos would see it as an infinite being of sheer availability of potential or possible being. In short, it is an ongoing process of becoming, as Whitehead and Griffin (1978) also see it in their process philosophy. Thus, Peirce solves Chalmer's problem with determinism in his double aspect theory in introducing a different evolutionary semiotic process ontology.

In Peirce's semiotic category of Firstness, possibility and pure feeling serve as a ground for the disclosure of this infinite potentiality and that pure abstract feeling, which Peirce points out can be found when inquirers muse freely over nature and the universe in which they are situated. Peirce defines in his paradigm, what he means by his foundational concept of *feeling* as follows:

By a feeling, I mean an instance of that kind of consciousness which involves no analysis, comparison, or any process whatsoever, nor consist on whole or in part of any act by which one stretch of consciousness is distinguished from another, which has its own positive quality which consist in nothing else, and which is of itself all that it is, however it may have been brought about; so that if this feeling is present during a lapse of time, it is wholly and equally present at every moment of that time. To reduce this description to a simple definition, I will say that by a feeling I mean an instance of that sort of element of consciousness which is all that is positively, in itself, regardless of anything else.

(Peirce, CP 1.306)

Peirce does not describe a world of thought or mind other than the material; only the one we are in when having experiences. Like Husserl, Peirce was not a dualist, and therefore did not work with a framework where the distinction between 'subject' and 'object' as well as 'inside' and 'outside' was primary. Thus, his view is compatible with Hans Fink's (2006) suggestion of a new ontology, which he calls an "unrestricted or absolute naturalism". Fink has developed this philosophy from important points in McDowell's (1998) book *Mind, Value and Reality.* His view takes the philosophical consequence of realizing that all things and phenomena are developed within the universe in accordance with the evolutionary worldview. We, therefore, do not see culture, mind, meaning, consciousness, and ethics to be outside nature. They are all natural phenomena and therefore inside nature, which is also compatible with the above quotes of Merleau-Ponty. What else can they be, when we do not work with an absolute dualism or any other systems that propose more or less invisible worlds outside nature? Bhaskar (1998) also develops a philosophy much like that, which he calls non-dualism after the Vedic thinker, Shankara.

The conclusion must be then, that we primarily live in a world of signs, the centre of the cybersemiotic star (Figure 1), where objects appear when we habitual connect certain differences or 'Secondnesses' - as Peirce calls them - and choose an interpretation in connecting a representamen (a primary sign) with an object into an interpretant in our mind. Some of these objects, which our embodied cognitive experiences show us, turn out to be things.

Thus, the first impression (immediate objects) is through experiences and communications with other semiotic beings. It is then modified to a true picture of things and processes to what Peirce calls Dynamic Objects. Thus, although Peirce at first blush can appear as a bio-psycho-social constructivist, he is a dynamic realist, believing in universals, but certainly not a physicalist. He calls his stance "Scholastic realism" inspired by Duns Scotus, but adding the important aspect of evolution (Boler, 1963). He is thus placing himself somewhere between Plato and Aristotle, but armed with an evolutionary worldview. Susan Haack explains the point very well:

Though what exists is real, what is real may not exist; existence is reaction, interaction - the characteristic mode of being of particulars, of seconds. This is why Peirce made a distinction between scholastic realism and what he called "nominalistic Platonism" [see CP 5.503 (c.1905); 5.470 (1903); 5.503 (c.1905)]: the thesis that universals like "man" or "horses" refer to abstract particulars, to existents. Peirce objected to nominalism and conceptualism because they deny that generals are real; he objected to nominalistic Platonism because it asserts that generals exist. Peirce's position was that there are real generals, not that generals are real.

(Haack, 1992, pp. 22-23)

Thus, Peirce's view of reality is very different from a modern physicalistic view combined into a dualism with Platonism in some sort of mathematical variant. The real in Peirce's paradigm is not only external things! Though, he does not doubt that the external is real. The existent is that, which reacts against other things. The external world then does not consist merely of existent objects and their reactions; because among the reals Peirce also counts words, signs, general types, and would-bes. Peirce writes:

Thus, for example, the real becomes that which is such as it is regardless of what you or I or any of our folks may think it to be. The external becomes that element which is such as it is regardless of what somebody thinks, feels, or does, whether about that external object or about anything else. Accordingly, the external is necessarily real, while the real may or may not be external; nor is anything absolutely external nor absolutely devoid of externality. Every assertory proposition refers to something external, and even a dream withstands us sufficiently for one description to be true of it and another not. The existent is that which reacts against other things. Consequently, the external world, (that is, the world that is comparatively external) does not consist of existent objects merely, nor merely of these and their reactions; but on the contrary, its most important reals have the mode of being of what the nominalist calls "mere" words, that is, general types and would-bes.

(Peirce, CP 8.191)

It is a fascinating attack on physicalism and, at the same time, Peirce used his whole life to develop and define scientific knowledge in the belief that it was the highest point of rationality man could attain. His phaneroscopic foundation of qualia is laid down most clearly in the following quote, which repays repeated reading:

No thought in itself, then, no feeling in itself, contains any others, but is absolutely simple and unanalyzable; and to say that it is composed of other thoughts and feelings, is like saying that a movement upon a straight line is

composed of the two movements of which it is the resultant; that is to say, it is a metaphor, or fiction, parallel to the truth. …Whatever is wholly incomparable with anything else is wholly inexplicable, because explanation consists in bringing things under general laws or under natural classes. Hence every thought, in so far as it is a feeling of a peculiar sort, is simply an ultimate, inexplicable fact. Yet this does not conflict with my postulate that that fact should be allowed to stand as inexplicable; for, on the one hand, we never can think, "This is present to me," since, before we have time to make the reflection, the sensation is past, and, on the other hand, when once past, we can never bring back the quality of the feeling as it was in and for itself, or know what it was like in itself, or even discover the existence of this quality except by a corollary from our general theory of ourselves, and then not in its idiosyncrasy, but only as something present. But, as something present, feelings are all alike and require no explanation, since they contain only what is universal…. Finally, no present actual thought (which is a mere feeling) has any meaning, any intellectual value; for this lies not in what is actually thought, but in what this thought may be connected with in representation by subsequent thoughts; so that the meaning of a thought is altogether something virtual. … At no one instant in my state of mind is there cognition or representation, but in the relation of my states of mind at different instants there is. In short, the Immediate (and therefore in itself unsusceptible of mediation -- the Unanalyzable, the Inexplicable, the Unintellectual) runs in a continuous stream through our lives; it is the sum total of consciousness, whose mediation, which is the continuity of it, is brought about by a real effective force behind consciousness.

(Peirce, CP5. 289)

It is the subjective and inter-subjectively shared first-person experiential consciousness, as its own first cause, which is for Peirce the basis of his semiotically based pragmaticistic philosophy. Thus, as a specific feeling or perceptual experience appears in consciousness as something (Secondness), it is compared and identified with another in the present or in the past (memory) though the theory of Thirdness producing symbols and arguments leading into language. This self-representation - the possibility to think and speak of 'me' or 'I' and compare that to 'you' - makes self-consciousness possible. Pure feeling, process, and possibility are connected in Peirce's semiotic philosophy, where signs and cognitive categories are produced, when habits of Thirdness mediating between Secondness and Firstness are slowly emerging over time. Kull et al. write about developing biosemiotics from this viewpoint:

Theses on the semiotic study of provide a collectively formulated set of statements on what biology needs to be focused on in order to describe life as a process based on semiosis, or signaction. An aim of the biosemiotic approach is to explain how life evolves through all varieties of forms of communication and signification (including cellular adaptive behavior, animal communication, and human intellect) and to provide tools for grounding sign theories.

(Kull, Deacon, Emmeche, Hoffmeyer & Stjernfelt, 2009, p. 1)

Thus, in the biosemiotic paradigm the primary unit of biosemiotic research is the "sign", not the quark, atom, or molecule. What counts as being true, is not a simple given. Knowledge of facts presupposes knowledge of theories (categorizations) and of values, just as knowledge of theories and values presupposes knowledge of facts. Inquiry is never disinterested; questions of what, how, and why are always intertwined. But, there are objective and reasonable standards, independent of any specific human interest, but not

independent of all human interest. Laying out principles of practical reasoning and showing how its universal and contextually relative components work together is the proper task of pragmaticists and was central to the core of Peirce's (1958) endeavor.

Consciousness as Communicated Life Worlds

I will here go further into describing why the centre of the Cybersemiotic star model is social semiotic interaction producing intersubjective knowing instead of an algorithmic pan-informational and pan-computational impersonal function. We deal with conscious impressions and expressions as the processes of sense experience and thinking before science has divided the world into subjects and objects - yes, even before we have distinguished and compared our individual feelings. Peirce sees it as an unlimited continuous stream of experiences and his lifelong analysis leads him to identify three basic categories: Firstness, as we have seen, is the stream of felt possibilities that gives rise to semiosis, when the momentary different aspects of consciousness (Secondness) interact and are related to one another through self-organization and cognition (Thirdness). In the quote below he introduces the three categories on a phenomenological basis:

First, feeling, the consciousness that can be included with an instant of time, passive consciousness of quality, without recognition or analysis; second, consciousness of an interruption into the field of consciousness, sense of resistance, of an external fact, of another something; third, synthetic consciousness, binding time together, sense of learning, thought. (Peirce, CP 1.377)

Firstness, Secondness, and Thirdness are thus, to Peirce, three basic states of consciousness as well as "outer reality" developing in an evolutionary interplay with each other over time. Thus, there is a deep connection between knowledge and time. This can be connected to the foundational importance of irreversibility in non-equilibrium thermodynamics that defies mechanicism with reversible time as the basis of science. There is also a deep connection between our semiotically guided cognitions and the way the outer world is organized, not in the least because we are connected to it both evolutionary and ecologically and through the way our culture survives. In a Peircean semiotics, phaneroscophy becomes an intersubjective signification sphere. He writes:

I use the word phaneron to mean all that is present to the mind in any sense or in any way whatsoever, regardless of whether it be fact or figment. I examine the phaneron and I endeavor to sort out its elements according to the complexity of their structure.

(Peirce, CP 8.213)

When we are studying socio-communication and acting from the point of language, we are acting in meaningful language studying other meaningful language. Knowledge is born within the frame of an unrestricted absolute naturalism. This makes it impossible for any of the other specialized approaches to knowledge (in the four arms of the star) to claim that they make a model of all of nature. All perception is embedded in consciousness; from the most rudimentary form as pure feeling in Firstness to human linguistic self-consciousness. For a basic transdisciplinary theory there is no theoretical interest in looking for something more original (material) "behind" the semiotic sense experience in a reality of potential signs. Materiality and energy are just two of the prerequisites for semiosis that have to be there at the same time with experience and language games (on the cultural level), and sign games (at the level of embodiment) (see Brier (1995)). We are, thus, immersed in semiotic webs of communication forms, be they verbal or non-verbal.

We cannot get completely out of our life world and language and thereby culture and power. The cultural-mental universe always

informs our knowledge. Nevertheless, that does not leave us in anti-realism and radical constructivism, because we accept the evolution of living systems in an ecological environment as another prerequisite. That, on the other hand, does not make us deny the value of first-person experience in a life world or a "signification sphere" as a prerequisite for sense experience, cognition functions, thinking, and second-person communicative experiences. These two last phenomena are viewed as Thirdness processes. In Peirce's 'Syllabus' of 1903 section, he introduced the subject of Thirdness and Thought:

Thirdness is found whenever one thing brings about a Secondness between two things. In all such cases, it will be found that Thought plays a part. By thought is meant something like the meaning of a word, which may be 'embodied in', that is, may govern, this or that, but is not confined to any existent. Thought is often supposed to be something in consciousness; but on the contrary, it is impossible ever actually to be directly conscious of thought. It is something to which consciousness may conform, as a written text may conform to it. Thought is rather of the nature of a habit, which determines the suchness of that which may come into existence, when it does come into existence. Of such a habit one may be conscious of a symptom; but to speak of being directly conscious of a habit, as such, is nonsense.

(Peirce, 1903, p. 269)

Habits develop meaning by directing attention, not to themselves, but to the real connections between phenomena. Habit and thinking, or thought, consist, in Peirce's semiotic paradigm, of concepts that are far more general than those of just psychology or even sociology, because they are connected to sign interaction and creation in general, or what Peirce calls "the semiotic web". According to Peirce's "Law of Mind" article in *The Monist*, habit is a cosmological principle and not only a psychological one (Peirce, 1892b). We think in or with thought-signs, but not only in or with brains. Semiosis is meaning-making and as such must have a deep ecological foundation:

Thought is not necessarily connected with a brain. It appears in the work of bees, of crystals, and throughout the purely physical world; and one can no more deny that it is really there, than that the colors, the shapes, etc., of objects are really there. Consistently adhere to that unwarrantable denial, and you will be driven to some form of idealistic nominalism akin to Fichte's. Not only is thought in the organic world, but it develops there. But as there cannot be a General without Instances embodying it, so there cannot be thought without Signs. …there can be no isolated sign. (Peirce, CP 4.551)

Peirce's phaneroscophy differs from Husserl's phenomenology as it assumes a monistic hylozoist theory of mind and matter as a continuum. In what physics calls "the beginning", mind is partly hidden inside matter. Peirce also realizes, as in phenomenology, we have to take seriously the observing and knowing ability of the human animal before it started making science. It is the prerequisite that we have to make clear before we can make any evaluation of scientific knowledge. Deely (2001) argues that Peircean semiotics is a perspective that arises from the attempt to make thematic, a ground common to all methods or, one could say, before all methods. From within this point of view, it becomes clear that Peircean semiotics is the study of the action of signs. It is what he calls a cenoscopic science.

Peirce (see for instance CP 1.181) divided the sciences into three types: 1. A science of discovery, 2. A science of review, and 3. Practical sciences. It is within the sciences of discovery that we find the concept of "cenoscopy". In the sciences of discovery Peirce has the following division: 1. (Pure) Mathematics, understood as that science which

draws necessary conclusions about hypothetical objects. 2. Cenoscopy, which he also calls primary philosophy, is about all positive perceived phenomena in general (inner or outer), which confront a person at every waking moment. This is where he sees his phaneroscophy placed. 3. Ideoscopic sciences, which is his name for the special or positive sciences. They have the purpose of discovering new phenomena through observation and experiments. This is the typical set up in natural sciences, trying to hold several factors stable in order to focus on one or two variables. Peirce also states: "Cenoscopic science, with its philosophical reflections, precedes the special or idioscopic sciences and is the place from where their individual contributions to man's knowledge of himself and the world should be evaluated and reflected upon" (Peirce, CP 1.288).

Thus, this article is Cenoscopic. However, in Peirce's phaneroscophy not all elements in the phaneron are being studied, only the elements that are indecomposable are focussed upon. These indecomposable phaneroscopic elements exemplify the most basic universal categories, and therefore become philosophically foundational. According to Peirce, the numbers of categories are three and only three (Peirce, CP 1.418, 1.292), as we have already adumbrated in various ways; he adds:

Of the three Universes of Experience familiar to us all, the first comprises all mere Ideas, those airy nothings to which the mind of poet, pure mathematician, or another might give local habitation and a name within that mind. Their very airy-nothingness, the fact that their Being consists in mere capability of getting thought, not in anybody's actually thinking them, saves their Reality. The second Universe is that of the Brute Actuality of things and facts. I am confident that their Being consists in reactions against Brute forces, notwithstanding objections redoubtable until they are closely and fairly examined. The third Universe comprises everything whose being consists in active power to establish connections between different objects, especially between objects in different Universes. Such is everything which is essentially a Sign – not the mere body of the Sign, which is not essentially such, but, so to speak, the Sign's Soul, which has its Being in its power of serving as intermediary between its Object and a Mind. Such, too, is a living consciousness, and such the life, the power of growth, of a plant. Such is a living constitution – a daily newspaper, a great fortune, a social 'movement'. (Peirce, CP 6. 455).

The dynamic interactions between these three categories make up the triadic sign, where the representamen is Firstness, the object is Secondness, and the interpretant is Thirdness. Together they produce meaning in all the living sign-producing beings in the form of primary modelling as a signification sphere (or animal life world) and a secondary modelling in the form of sign games (Cobley, 2010). In humans, a grammatically ordered generative system of signs obtains a special social function as the type of modelling system we call "natural language". Language emerged as an evolutionary adaptation over two million years ago. Maybe it started as a mute semiotic modelling system in Homo Habilis. Peirce's semiotics is a kind of double hypothetical realism, since he believes in a - from the observer, partly independent - reality, and at the same time that the embodied observer is a product of this same reality, which thus anchors the result of scientific investigations in a realist evolutionary framework including an ontological place for the phaneroscopic first-person experience (Peirce & Turrisi, 1997).

Peirce argues that it is not possible for us to contemplate the immediate immense stream of consciousness that is the 'Now' in the 'Now'. We can only know the 'Now' by attaching signs to it afterwards, and this process is connected to the arrow of time (Brier, 2008b). Aristotle wrote that the universe is the place of all things,

but it does not have a place of its own. Thus, theories of what the universe is "placed" within and to which degree it is closed is a crucial area of investigation these days. One direction of research is the new theories of multiverses, where billions of universes might exist, but have no empirical contact with each other what so ever (Carr, 2007). The void is not a "something" but a "no-thing". The concepts of nothingness and emptiness are central to Peirce's philosophy, as well as Spencer-Brown's evolutionary theory of how form or the basic categories come into existence in *Laws of Form* (1969). Peirce and Spencer Brown's (1979) theories of a dynamic emptiness around and before the material universe are interesting candidates for a new transdisciplinary ontology and may fit well with John Archibald's ontological interpretation of Bohr in a theory of a participatory universe (Brier, 2009a; Wheeler, 1994, 1998). Wheeler (1994, 1998) argues that reality exists not on the basis of physical particles alone, but rather because of our acts of observing the universe. In a Peircean framework, observation is based on semiotic interpretation. Where Wheeler formulates his philosophy as "it from bit" a Peircean formulation would be "something rather than nothing from semiosis". In Wheeler's work and that of other physicists like Stapp (2007) interpretations of the laws of quantum mechanics, our observations of experiments at the quantum level influence the universe at such fundamental levels that they might have serious consequences also on a macro level. Based on his interpretation of many delayed choice experiments, Wheeler suggests that the universe could be built like an enormous feedback loop between our consciousness and reality, contributing to the ongoing creation of the present and the future state of reality. He even goes so far as to include the past as well. However, unfortunately – as with most physicists – his philosophy does not deliver a theory of first-person consciousness and its place and emergence in nature. Therefore, I suggest that it is being replaced by Peircean semiotics.

We are, thus, in this evolutionary ontological theory of Peirce and Wheeler part of a universe that is still developing and rearranging itself including its own beginning! Nicolescu – who is also a quantum physicist – promotes, like Peirce does, the theory that consciousness is a vital and active part of the wholeness of the universe (Nicolescu, 2002, p.65-66). The subjective and the objective side of nature make up the whole of reality to an integrated whole based in what Nicolescu calls trans-nature or the zone of non-resistance. Wheeler's view moves the mystery of creation from being not only something in a very distant past we have no influence on, to being something that also goes on in the living present. As such he is close to Peirce's evolutionary concept of hylozoism. In philosophy, "hyle" refers to matter or stuff; the material cause underlying change in Aristotelian philosophy. It is that, which remains the same, in spite of the changes in forms. In opposition to Democritus' atomistic ontology, hyle in Aristotle's ontology is a plenum or a sort of field. Aristotle's world is an uncreated eternal cosmos, but Peirce used the term in an evolutionary philosophy of a world that has an end and a beginning. Hylozoism - in this context - is the philosophical conjecture that all material things possess life. Hylozoism is different from the panpsychist idea of everything possessing a soul. Instead it attributes some form of sense ability to all matter, very much like Whitehead's pan-experientialism. Hylozoism is not a form of animism either, as the latter tends to view life as taking the form of discrete spirits. Scientific hylozoism is a protest against a mechanical view of the world as dead, but at the same time through synechism upholds the idea of a unity of organic and inorganic nature and derives all actions of both types of matter from natural causes. We are the systems

developed in and by the universe that are most highly developed to make the universe look at itself. As the universe in its fundamental quantum level is still partly undetermined it is in an ongoing re-arranging process of building itself (even all the way back to the Big Bang). Rugh and Zinkernagel (2009), for instance, doubt the idea of claiming at universal time. Nicolescu explains this further when he writes: "Nature seems more like a book in the process of being written: the book of Nature is therefore not so much to be read as experienced, as if we are participating in the writing of it" (Nicolescu, 2002, p. 65). That also seems to be Wheeler's view, as well as Peirce's (Davies, 2004).

Thus, it simply does not make any sense to ask if the universe would exist if there were no observers, because there would be no knowledge if there were no observers, no language, culture, and meaning. This reflective observation also puts an interesting limit to the scope of scientific knowledge. It is a knowledge produced inside the universe in time and space. It is an important part of Wheeler's theory that humans are not the only observers but creative participators.

Thus, the theory of the participatory universe raises a fundamental problem of whom or what qualifies to be an observer or a thinking agent (Brier, 2007, 2009a). New foundational theories of agency and the quality necessary to be an observer have appeared (Sharov, 2010; Arrabales Ledezma, & Sanchis, 2009). That problem cannot be solved here, but seems to be related to C.S. Peirce's idea of semiosis - the ability to make signs and interpret them meaningfully - as not only being limited to humans, but including all living systems with a fuzzy border to the precursor systems of life, making thinking something that goes on in an ecological systemic context like also Bateson views it (Brier, 2008c).

The self-organizing universe

I agree with Bateson (1972) and Maturana (1988a, 1988b) that we must start our understanding of information with the process of knowing. Bateson's definition of information as a difference that makes a difference is very fruitful. His problem is that he nearly makes every cybernetic system a communicator and a knower, be it a homeostatic machine, an organism or an ecosystem or organisation. However, the big difference between computers and humans is this embodied field of meaning that human communication operates in.

It also gives us a background to understand why the un-personalized, and un-embodied logical and mathematical reasoning that has been the foundation of the mechanical paradigm of classical science cannot hold when we look at the actual human practises in the scientific institutions, when investigated by philosophy and sociology of science.

The paradox is that the sciences think this domain of awareness, sense experiences, and meaning appears later in evolution than energy, matter, and information, but we have also shown that it is the prerequisite for the intersubjective knowing process, from which the whole idea of science springs. The irreversible time of evolutionary explanation works one way (outside in the Cybersemiotic Star model) and the explanation of the nature of knowledge and science works the opposite way (from the middle and out in the model). The production of knowledge seems to be like a kind of breathing in and out in an ongoing process.

As I have argued for above, I object to the use of the term "nature", as well as the human body, to mean only what physico-chemical sciences can describe. What we can measure inter-subjectively is a part of the reality we call nature; meaning that it has some kind of existence more or less independent of the individual human being, though we are still connected to all other things and bodies by being in the same world or Nature and made by the same "stuff". I see no reason in such a non-reductionist transdisciplinary paradigm to assume that physics has a special privileged position in

explaining what this universal "stuff" is. With Peirce I prefer the concept of hylé, which was fundamental to Aristotle's philosophy, but which Peirce moved into an evolutionary semiotic process oriented paradigm.

On the matter of expanding our ontological basis to construct a transdisciplinary Wissenschaft, I suggest we redefine this "basic stuff" to hylè in a way that can encompass this evolutionary monistic way of understanding the world. When science reifies this substance to be inert matter in an atomistic thinking (devoid of life and mind, and subject only to mechanical and statistical laws) and creates a worldview, where everything - including life and mind - comes into being through the self-organization of matter through evolution, this move is clearly self-contradictory as it leaves out the observer (Fink, 2006; Brier, 2010a). The development of organisms is entangled with triadic semiosis, but a semiosis that is broader than life and already at work prior to the emergence of life in bringing about the changes of the physical surroundings, which made the emergence of life in the first place possible (Deely, 2001).

Conclusion

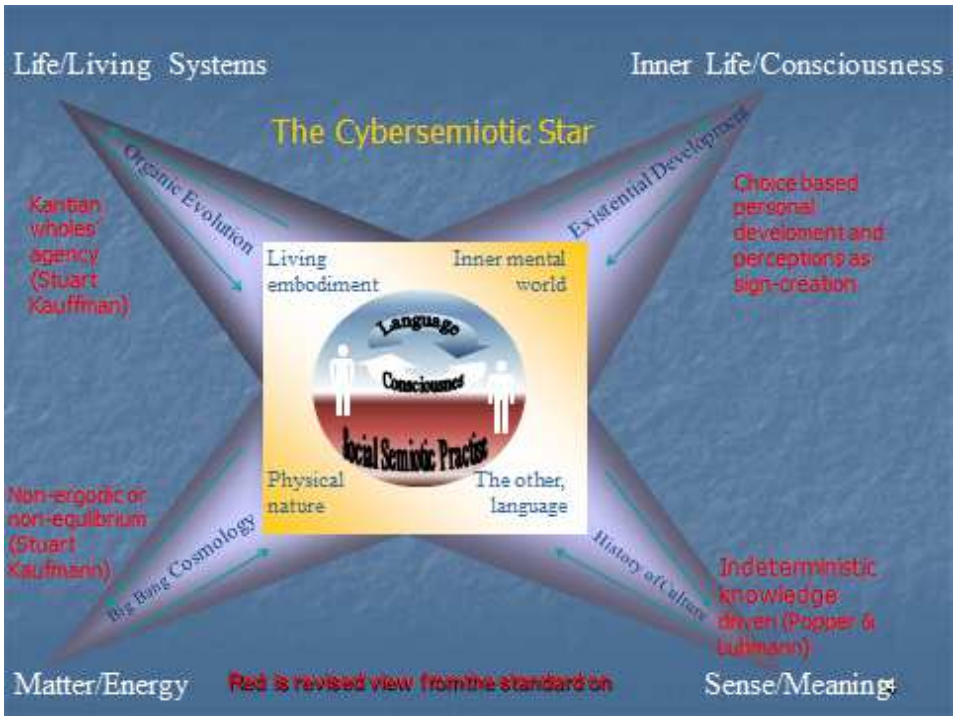
Let us return to the Kant's quote on nature and free will and continue it a little further. Kant writes about the contradiction between free will and a lawful view of nature:

It is an indispensable problem of speculative philosophy to show that its illusion respecting the contradiction rests on this, that we think of man in a different sense and relation when we call him free, and when we think of him as subject to the laws of nature …. It must therefore show that not only can both of these very well co-exist, but that both must be thought of *as necessary united* in the same subject, (Kant, 1909, p. 76)

I think it is the kind of work we have here pursued towards a Wissenschaft of consciousness and the human body that should be able to include mental events in an absolute naturalism, which I think is necessary for the development of an integrative paradigm of medicine. Let me conclude here also by bringing a more advanced version of the Cybersemiotic star model, in which knowledge is developing in all four 'arms' at the same time. Results from empirical research falsify our theories and force us to theoretically reconfigure our present knowledge into new theories and models to cope with the knowledge and experience we have now gained. The challenge is now to reintegrate all the different research paradigms we have developed and specialized into a greater whole. But to make such a shift one needs to develop an ontology that can encompass the ontologies of all the four views in a somewhat relativized version - not claiming to be able to explain all of nature on its own - and combining them into a transdisciplinary setting.

Conflict of Interests

Authors have no conflict of interests.



I have suggested to take point of departure in C.S. Peirce's pragmaticist, evolutionary semiotic process philosophy, where semiotic social interactions between embodied more or less free minds in nature is viewed as the central process of knowledge production, which is also behind the selfsame "sciences" that attempt to explain meaning production and consciousness. Thus, the view does not deny the necessity of brains to produce consciousness. However, for a brain to be part of the production of experience it has to be connected to a feeling body of living flesh and a peripheral nervous system with specialized sense organs. We can model our bodies on animal's behavior, but not its feelings per se. Still we must accept that first person feelings and perceptions are prerequisites to having consciousness, free will, language, and cultural meaning, which are necessary in order to produce ordinary common sense knowledge of which scientific knowledge is a culturally developed refinement. This, however, makes it impossible to view mind and brain as two independent entities that have simple, independent, and different causal relationships. They are deeply interconnected, which is also shown in Peirce's synechist view of the "basic stuff "of reality as hylé. Thus, we return to a partly Aristotelian view adding evolution plus modern phaneroscophy (Peircean phenomenology) and biology in the form a biosemiotics. This could be the theoretic foundation for a more semiotic and holistic based transdisciplinary medical research tradition.

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